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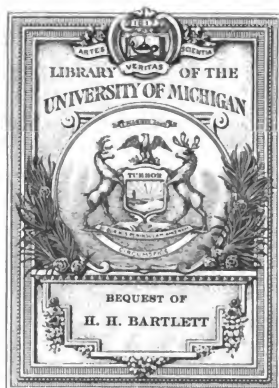
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Susan Lockwood
from her Father
1861.

THE
North American Sylva;
OR, A DESCRIPTION OF THE
FOREST TREES
OF THE
UNITED STATES, CANADA, AND NOVA SCOTIA.
CONSIDERED PARTICULARLY
WITH RESPECT TO THEIR USE IN THE ARTS AND THEIR
INTRODUCTION INTO COMMERCE.
TO WHICH IS ADDED
A DESCRIPTION OF THE MOST USEFUL OF THE
EUROPEAN FOREST TREES.

ILLUSTRATED BY 156 COLORED ENGRAVINGS.

TRANSLATED FROM THE FRENCH OF
F. ANDREW MICHAUX,
MEMBER OF THE PHILOSOPHICAL SOCIETY OF PHILADELPHIA, ETC. ETC.

WITH NOTES BY J. JAY SMITH,
EDITOR OF THE HORTICULTURIST, MEMBER OF THE ACADEMY OF NATURAL SCIENCES, ETC.

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A. Rube del.

Cabbage Tree.
Chameroops palmella.

*A. R. de la*

Cabbage Tree.
Chamerope palmella.

THE
NORTH AMERICAN
SYLVA.

CABBAGE TREE.

CHAMÆROPS PALMETTO. *C. caule arborco; frondibus palmatis, plicatis, stipitibus non aculeatis.*

Hexandria trigynia. LINN. Palmae. JUSS.

FROM its lofty height, this vegetable is considered in the United States as a tree; and upon the shores of the ocean, where it grows, it is called Cabbage-tree. It belongs to the genus of the Palms, and is found farther north than any other species in America, being first seen about Cape Hatteras, in the 34th degree of latitude, which, in the temperature of the winter, corresponds with the 44th in Europe. From Cape Hatteras it spreads to the extremity of East Florida, and probably encircles the Gulf of Mexico. I have no doubt that it exists also in Cuba and the Bahama Isles; I have seen it in Bermuda, which is more than 600 miles from the coast of North America.

Farther south the Cabbage-tree is not confined, as in the United States, to the immediate vicinity of the sea; on the

river St. John, in Florida, a few miles above Lake George, I caused two stocks to be felled at the distance of forty or fifty miles from the shore.

A trunk from forty to fifty feet in height, of a uniform diameter, and crowned with a regular and tufted summit, gives to the Cabbage-tree a beautiful and majestic appearance. Its leaves are of a brilliant green, palmated, and borne by petioles from eighteen to twenty-four inches long, nearly triangular, and united at the edges; they vary in length and breadth from one foot to five feet, and are so arranged that the smallest occupy the centre of the summit, and the largest the circumference. Before their development they are folded like a fan, and, as they open, the outside sticks break off and fall, leaving the base surrounded with filaments woven into a coarse, flimsy, and russet web.

The base of the undisclosed bundles of leaves is white, compact, and tender; it is eaten with oil and vinegar, and resembles the artichoke and the cabbage in taste, whence is derived the name of Cabbage-tree. But to destroy a vegetable which has been a century in growing, to obtain three or four ounces of a substance neither richly nutritious nor peculiarly agreeable to the palate, would be pardonable only in a desert which was destined to remain uninhabited for ages. With similar prodigality of the works of nature, the first settlers of Kentucky killed the Buffalo, an animal weighing 1200 or 1500 pounds, for the pleasure of eating its tongue, and abandoned the carcass to the beasts of the wilderness.

The Cabbage-tree bears long clusters of small, greenish flowers, which are succeeded by a black, *inesculent* fruit, about the size of a pea.

In the Southern States the wood of this tree, though extremely porous, is preferred to every other for wharves: its superiority consists in being secure from injury by sea-worms, which, during the summer, commit such ravages in structures



Pride of India.
Melia azadirach.

accessible to their attacks; but, when exposed to be alternately wet and dry in the flowing and ebbing of the tide, it decays as speedily as other wood. This use of the Cabbage-tree is rapidly diminishing its numbers, and probably the period is not distant when it will cease to exist within the boundaries of the United States.

In the war of Independence the Cabbage-tree was found eminently fitted for constructing forts, as it closes on the passage of the ball, without splitting.

The growth and development of the Palms have occupied the attention of distinguished botanists, to whose memoirs the reader is referred for more accurate information. The tardy growth of this species will always discourage its propagation.

PLATE CL.

A Cabbage-tree with its Fruit.

PRIDE OF INDIA.

MELIA AZEDARACH. *M. foliis bipinnatis.*

Decandria monogynia. LINN. Meliæ. JUSS.

THIS tree is a native of Persia. For the beauty of its flowers and the elegance of its foliage, it has long been in request in southern climates for embellishing towns and adorning the environs of dwellings. It is propagated for this purpose in India, in the Isles of France and Bourbon, in Syria, Spain, Portugal, Italy, and the southern departments of France. In the New World it is found in several towns of the West Indies and of South America; and on the Northern Continent it is so abun-

dant and so easily multiplied in the maritime parts of the Southern States as to be ranked among their natural productions. This claim upon our attention is enforced by the valuable properties of its bark and of its wood.

The Pride of India rises to the height of thirty or forty feet, with a diameter of fifteen or twenty inches; but, when standing alone, its growth is usually arrested at a lower elevation, and it spreads into a spacious summit. Its leaves are of a dark green color, large, doubly pinnate, and composed of smooth, acuminate, denticulated leaflets. The lilac flowers, which form axillary clusters at the extremity of the branches, produce a fine effect, and exhale a delicious odor. The ripe seeds are large, round, and yellowish; they are sought with avidity by certain birds, particularly by the red-breasts, in their annual migration to the South, which, after gorging themselves immoderately, are sometimes found stupefied by their narcotic power. The venomous principle which resides in this tree is taken notice of by Avicenna, an Arabian physician who flourished about the year 980. In Persia the itch is cured with an ointment made by pounding its leaves with lard.

The Pride of India prospers in a dry and sandy soil, and magnificent stocks are seen in the streets of Charleston and Savannah. Its foliage, which, as well as the flowers, is developed early in the spring, affords a delightful refreshment to the eye, and yields a shelter from the fervor of the sun during the intense heat of summer. It grows with such rapidity that from the seed it attains the height of twelve or fifteen feet in four years. This surprising vegetation is chiefly remarked in stocks less than ten years of age, in which the concentric circles are more distinct than in any other tree. Like the Locust, it possesses the valuable property of converting its sap into perfect wood in the earliest stages of its growth: a stock six inches in diameter has only an inch of sap, and consequently may be employed almost entire. The wood is of a reddish color, and is

similarly organized with that of the Ash: it receives a less brilliant polish than the Red Bay, the Wild Cherry, the Maple, and the Sweet Gum; but this defect is unimportant in a country which possesses the species just mentioned and can easily procure Mahogany. The Pride of India is sufficiently durable and strong to be useful in building, and it will probably be found adapted to various mechanical uses; it has already been employed for pulleys, which in Europe are made of Elm, and in America of Ash. I have been assured that it is excellent fuel.

This succinct description deserves attention in the southern parts of North America, and in those countries of Europe where the Pride of India is considered as an ornamental rather than as a useful tree. Fields exhausted by cultivation and abandoned might be profitably covered with it.

PLATE CII.

A leaf of a third part of the natural size. Fig. 1. Flowers of the natural size. Fig. 2. Seeds of the natural size.

[The Pride of India cannot be considered hardly as far north as Philadelphia, where its limbs are killed regularly every year; the root survives, and stools are again produced in the spring.]

PISTACIA TREE.

PISTACIA VERA. *P. foliis impari-pinnatis; foliolis subovatis, recurvis, coracis.*

Diœcia pentandria. LINN. Terebinthaceæ. JUSS.

THE Pistacia-tree is indigenous to Asia Minor, and is particularly abundant in Syria. It equals, and sometimes exceeds, twenty-five or thirty feet in height, and has heavy, crooked limbs clad in a thick, grayish bark, and large leaves composed of one or two pair of coriaceous leaflets, with a terminal odd one. This vegetable belongs to the class of dioecious plants whose sexes are borne by different stocks. The barren flowers are minute and hardly apparent, and the fertile ones are likewise small and of a greenish color. Its fruit consists of thin-shelled oval-acuminate nuts, about the size of an olive, which are collected in bunches, and are commonly yielded in profusion. They are of a more agreeable flavor than the hazel-nut or almond, and are annually exported to those parts of Europe and Asia where the trees do not flourish.

The Pistacia-tree succeeds in dry, calcareous, stony grounds, but shuns a sandy and a humid soil. In forming plantations, care must be taken to possess trees of different sexes, without which the fructification is impossible; one male should be allotted to five or six females, and, to avoid mistake, young grafted stocks should be procured, or suckers from the foot of an old tree.

The wood is hard, resinous, excellent for fuel, and fitted for economical purposes.

According to Pliny, pistacia-nuts were first brought to Rome about the reign of Tiberius, by Vitellius, Governor of Syria; and probably the tree was introduced into Italy at the same



Pavia del

Gabriel nulp

Pistacia Tree.
Pistacia vera



Breca del

J. D. Schreyer

American Chestnut.
Castanea vesca.

period. It has long been cultivated in Spain, Portugal, and the south of France; and, when protected by a wall and favored with a southern exposure, it yields fruit even at Paris. It is less delicate than the Orange-tree, and prospers in the same soil and climate with the Olive. Though it offers less powerful inducements than the Olive to attempt its introduction into West Tennessee and the Southern States, it would afford an agreeable addition to the luxuries of the table.

PLATE CIII.

A branch with fruit of the natural size. Fig. 1. A barren flower. Fig. 2. A fertile flower. Fig. 3. Fruit with the nut exposed. Fig. 4. A nut with the kernel exposed. Fig. 5. A kernel without the pellicle.

AMERICAN CHESTNUT.

CASTANEA VESCA. C. foliis lanceolatis, acuminatò-serratis, utrinquè glabris; nucibus dimidio superiore villosis.

Monœcia polyandria. LINN. Amentaceæ. JUSS.

THE Chestnut does not venture beyond the 44th degree of latitude. It is found in New Hampshire between the 43d and the 44th degrees; but such is the severity of the winter, that it is less common than in Connecticut, New Jersey, and Pennsylvania. It is most multiplied in the mountainous districts of the Carolinas and of Georgia, and abounds on the Cumberland Mountains and in East Tennessee.

The coolness of the summer and the mildness of the winter in these regions are favorable to the Chestnut; the face of the country, also, is perfectly adapted to a tree which prefers the

sides of mountains or their immediate vicinity, where the soil in general is gravelly, though deep enough to sustain its perfect development. The Chestnut of the Old World attains its greatest expansion in similar situations: an example is said to exist on Mount Etna of a Chestnut 160 feet in circumference, or about fifty-three feet in diameter, and large enough to shelter one hundred men on horseback beneath its branches; but its trunk is hollowed by time almost to the bark: near it stand several others more than seventy-five feet in circumference. At Sancerre, in the Department of the Cher, 120 miles from Paris, there is a Chestnut which, at six feet from the ground, is thirty feet in circumference; 600 years ago it was called the *Great Chestnut*, and, though it is supposed to be more than one thousand years old, its trunk is still perfectly sound and its branches are annually laden with fruit. I have never met with instances of such extraordinary growth in the United States; but the American species is probably susceptible of an equal development, since, in the forests of North Carolina, it is commonly as tall and as large as the corresponding species in those of Europe. I have measured several stocks which, at six feet from the ground, were fifteen or sixteen feet in circumference, and which equalled the loftiest trees in stature.

The Chestnut is a stranger to the province of Maine, the State of Vermont, and a great part of Genesee, to the maritime parts of Virginia, to the Carolinas, Georgia, the Floridas, and Louisiana as far as the mouth of the Ohio.

Though the American Chestnut nearly resembles that of Europe in its general appearance, its foliage, its fruit, and the properties of its wood, it is treated by botanists as a distinct species. Its leaves are six or seven inches long, one and a half inch broad, coarsely toothed, of an elongated oval form, of a fine brilliant color and of a firm texture, with prominent parallel nerves beneath. The barren flowers are whitish, unpleasant to the smell, and grouped on axillary peduncles four or five inches

long. The fertile aments are similarly disposed, but less conspicuous. The fruit is spherical, covered with fine prickles, and stored with two dark-brown seeds or nuts about as large as the end of the finger, convex on one side, flattened on the other, and coated round the extremity with whitish down. They are smaller and sweeter than the wild chestnuts of Europe, and are sold in the markets of New York, Philadelphia, and Baltimore.

The wood is strong, elastic, and capable of enduring the succession of dryness and moisture. Its durability renders it especially valuable for posts, which should be made of trees less than ten inches in diameter and charred before they are planted in the earth. In Connecticut, Pennsylvania, and a part of Virginia, it is also preferred for rails, and is said to last more than fifty years. For shingles this wood is superior to any species of Oak, though it has the same defect of warping. It is not extensively used for staves, and its pores, like those of the Red Oak, are so open that it is proper only for dry wares; the European species, which is more compact, is employed in Italy to contain wines and brandy.

Throughout France and the south of Europe, young Chestnuts are almost exclusively chosen for hoops; and they are found to be better adapted to this important use than any other species, as they last longer in the humidity of the cellar. I have been informed by coopers at New York and Philadelphia that the American Chestnut is too brittle for hoops; if such is the fact, the European species has the advantage of superior flexibility. A more probable reason is that it is not strong enough to remain firmly attached, like the Hickory, by crossing the ends, but requires to be bound with osier, which is an additional labor and expense.

The Chestnut is little esteemed for fuel, and is not used in the cities of the United States: like the kindred species in Europe, it is filled with air and snaps as it burns. The coal is excellent, and, on some of the mountains of Pennsylvania where

the Chestnut abounds, the woods in the neighborhood of the forges have been transformed into copses, which are cut every sixteen years for the furnaces. This period is sufficient to renew them, as the summer is warmer in America than in Europe, the atmosphere more moist, and consequently vegetation more rapid. The proprietors of forges in Virginia, in the upper part of the Carolinas, and on the Holston, should imitate the example by establishing copses of Chestnut and Oak. Besides the inducement of private gain, this measure would be attended with public benefit by the economy of fuel, which is daily becoming scarcer and more costly. Among the Oaks, the Rock Chestnut Oak should be selected for this object, for reasons indicated in describing it.

Chestnut copses are considered in France as the most valuable species of property: every seven years they are cut for hoops, and the largest branches serve for vine-props; at the end of fourteen years they furnish hoops for large tubs; and at the age of twenty-five years they are fit for posts and for light timber. Lands of a middling quality, which would not have produced a rent of more than four dollars an acre, in this way yield a mean annual revenue of from sixteen to twenty-four dollars.

Different methods are pursued in forming the copses. In the New Dictionary of Natural History the following is preferred:— After the ground has been carefully loosened with the plough and the harrow, lines are drawn six feet apart, in which holes about a foot in depth and in diameter are formed at the distance of five feet. A chestnut is placed in each corner of the holes and covered with three inches of earth. As the soil has been thoroughly subdued, the nuts will spring and strike root with facility. Early in the second year three of the young plants are removed from each hole, and only the most thriving is left. The third or fourth year, when the branches begin to interfere with each other, every second tree is suppressed. To insure its success, the plantation should be begun in March or April, with

nuts that have been kept in the cellar during the winter in sand or vegetable mould, and that have already begun to germinate.

The European Chestnut would be a valuable acquisition to many parts of the United States. This tree produces the nuts called *Marrons de Lyon*, which are four times as large as the wild chestnuts of America, and which are sent from the vicinity of Lyons to every part of France and to the north of Europe; they were formerly exported also to the West Indies. Kentucky, West Tennessee, and the upper part of Virginia and the Carolinas, are particularly interested in the introduction of this species. It already exists in the nurseries of Philadelphia and New York, and it is only necessary to procure a few stocks to furnish grafts for young Wild Chestnuts transplanted from the woods or reared in the nursery.*

The Chestnuts may be grafted by inoculation or the insertion of a shoot. The common method is by lopping a branch of the wild tree, removing a girdle of the bark near the end, from one to three inches wide, and replacing it by another from a limb of the cultivated stock of corresponding diameter. The lower edge of the new covering is exactly adjusted to the natural bark, but a portion of the limb is left exposed above, which is scraped down so as to form a species of tent or dressing, and the whole is protected from the weather by a coating of clay.

PLATE CIV.

Leaves and aments of the natural size. Fig. 1. Full-grown fruit. Fig. 2. A chestnut.

* The European cultivated Chestnut is now grown in the United States: at Burlington, New Jersey, there are sixteen trees in the grounds of Mr. Askew which have produced in one year sixteen bushels of these fine nuts, which sold readily for six to eight dollars the bushel.—(See also Nuttall's Supplement, vol. i. p. 35, *et seq.*)

[Emerson has given the following dimensions of Chestnut-trees in Massachusetts,—viz.: one on the land of Joseph Houghton, with an erect, undivided trunk of forty or fifty feet and several large branches above, which measured, in 1840, twenty-one feet three inches in circumference at the surface: another, twenty-two feet eight inches: one is mentioned in Hopkinton which measured, in 1826, twenty-five and a half feet: another, southeast of Monument Mountain, had attained, in 1844, at the surface, thirty feet three inches in circumference. Still more remarkable specimens no doubt exist farther south, of whose measurements I have no record.]

CHINCAPIN.

CASTANEA PUMILA. *C. foliis ovalibus serratis, subtus incano-tomentosis; fructu parvo, in singulis capsulis echinatis unico.*

THE Chincapin is bounded northward by the eastern shore of the river Delaware, on which it is found to the distance of one hundred miles from Cape May. It is more common in Maryland, and still more so in the lower part of Virginia, of the Carolinas, Georgia, the Floridas, and Louisiana as far as the river of the Arkansas. In West Tennessee it is multiplied around the prairies enclosed in the forests, and it abounds throughout the Southern States wherever the Chestnut is wanting.

In New Jersey, Delaware, and Maryland, the Chincapin is a large shrub rarely exceeding the height of seven or eight feet; but in South Carolina, Georgia, and Lower Louisiana, it is

Roxm del^t

Gussone sc

Chincapin.
Castanea pumila.

sometimes thirty or forty feet high and twelve or fifteen inches in diameter.

The leaves are three or four inches long, sharply toothed, and similar in form to those of the American Chestnut, from which they are distinguished by their inferior size, and by the whitish complexion of their lower surface. The fructification, also, resembles that of the Chestnut in form and arrangement; but the flowers and fruit are only half as large, and the nut is convex on both sides and about the size of the wild hazel-nut. The nuts of the Chincapin are brought into the markets, and are eaten raw by children. The improvement of the Chestnut or of the Chincapin seems hardly to deserve attention, since the cultivated variety of Europe can easily be procured.

In the south of the United States the Chincapin fructifies on the most arid lands, but it is stunted to six or seven feet in height: its perfect development requires a cool and fertile soil. As it springs everywhere with facility, except in places liable to be covered with water, it is among the most common shrubs.

The wood of this species is finer-grained, more compact, heavier, and, perhaps, more durable, than that of the Chestnut. It is perfectly fitted for posts, and lasts in the earth more than forty years. Stocks of sufficient size are so rarely found, that it is only accidentally employed for this purpose; and, if the method of forming enclosures practised in the centre of the United States should prevail in the south, the Pride of India would merit a decided preference over the Chincapin. The saplings of this species are laden with branches while they are no thicker than the finger, and are thus rendered too knotty for hoops. In the Southern States, where the White Oak and the Hickories are comparatively rare, perhaps the Chincapin might be advantageously reared for this purpose in copses. But it is a tree of secondary importance, which can be recom-

mended only to amateurs desirous of enriching their collections with a species of Chestnut interesting for the beauty of its foliage and the diminutive size of its fruit.

PLATE CV.

A branch with leaves and a barren ament of the natural size. Fig. 1. Full-grown fruit. Fig. 2. A nut.

WHITE BEECH.

FAGUS SYLVESTRIS. *F. foliis acuminatis, obsolete dentatis, margine ciliatis.*

IN North America and in Europe the Beech is one of the tallest and most majestic trees of the forest. Two species are found in Canada and in the United States, which have hitherto been treated by botanists as varieties; but my own observations confirm the opinion of the inhabitants of the Northern States, who have long since considered them as distinct species and given them the names of White Beech and Red Beech, from the color of their wood. In the Middle, Western, and Southern States, the Red Beech does not exist, or is very rare, and the other species is known only by the generic name of Beech. I have retained for the White Beech the Latin specific name of *Fagus sylvestris*, which corresponds with the short description in the *Flora Boreali-Americana*, and have given to the Red Beech that of *Fagus ferruginea*, which accords with the descriptive phrase in the edition of 1805 of Willdenow's *Species Plantarum*.

A deep, moist soil and a cool atmosphere are necessary to the utmost expansion of the White Beech, and it is accordingly most multiplied in the Middle and Western States. Though



P. J. Berthoud del.

White Beech.
Fagus sylvestris.

it is common in New Jersey, Pennsylvania, Maryland, and throughout the country east of the mountains, it is insulated in the forests, instead of composing large masses as in Genesee, Kentucky, and Tennessee. I found the finest beeches on the banks of the Ohio between Gallipolis and Marietta, and measured several stocks growing near each other which were eight, nine, and eleven feet in circumference, and more than one hundred feet high. In these forests, where the Beeches vegetate in a deep and fertile soil, their roots sometimes extend to a great distance even with the surface, and, being entangled so as to cover the ground, they embarrass the steps of the traveller and render the land peculiarly difficult to clear.

The White Beech is more slender and less branchy than the Red Beech; but its foliage is superb, and its general appearance magnificent. The leaves are oval-acuminate, smooth, shining, and bordered in the spring with soft hairy down. The sexes are borne by different branches of the same tree. The barren flowers are collected in pendulous, globular heads, and the others are small and of a greenish hue. The fruit is an erect capsule covered with loose, flexible spines, which divides itself at maturity into four parts, and gives liberty to two triangular seeds. The bark upon the trunk of the Beech is thick, gray, and, on the oldest stocks, smooth and entire. The perfect wood of this species bears a small proportion to the sap, and frequently occupies only three inches in a trunk eighteen inches in diameter. The specific name of White Beech is derived from the color of the alburnum; and it should be observed that trees of the same genus are more frequently distinguished in the United States by the complexion of their wood than by the differences of their foliage and of their flowers. The properties of this wood will be more particularly mentioned in the description of the Red Beech.

On the banks of the Ohio and in some parts of Kentucky, where the Oak is too rare to afford bark enough for tanning, the

deficiency is supplied by that of the White Beech: the leather made with it is white and serviceable, though avowedly inferior to what is prepared with the bark of the Oak.

The Beech-wood brought for fuel to the market of Philadelphia bears a small proportion to the Oak and the Hickory; hence, we presume that it is comparatively little esteemed.

Notwithstanding the beauty of this tree, the properties of its wood are not such as to entitle it to attention in Europe.

PLATE CVI.

A branch with leaves and fruit of the natural size. Fig. 1. A beech-nut.

[*Soil, Propagation, &c.* Michaux has mentioned above the soil best suited to the Beech. It will thrive in elevated situations, but is not found at so great a height as the Sycamore, or even the Oak. This species is universally propagated by the seed, and the varieties, of which the Copper presents a most pleasing one for ornamental planting, by budding, grafting, or in-arching. Shake the nuts from the tree as they ripen; dry them in the sun, or in an airy shed or loft, after which they may be mixed with sand that is perfectly dry at the rate of three bushels of sand to one of mast, which only retains its vital properties for one year. Sow the seeds one inch apart in March, in a light rich soil, and cover them about one inch; the tender young plants will appear in May, when, if the season is dry, they should be moderately watered. In March, next season, with a spade made very sharp for the purpose, undermine the roots and cut them between four or five inches under ground. After the plants have stood two years, or if, in poor soil, three years, they may be transplanted in lines two feet asunder, and in three or four years they may be removed into a general plantation. At their removal they must not be pruned at all, but when once established they may be pruned at pleasure.



P. v. Del.

G. v. Del.

Red Beech
Fagus ferruginea.

Our author is in error in undervaluing the wood of the Beech-wood as fuel; comparing it with hickory, Bull found it to be as sixty-five to one hundred: its ashes furnish a great quantity of potash. The Beech forms a good screen against wind, and its leaves are strongly recommended by European writers for filling beds, which last longer than those filled with straw.]

RED BEECH.

FAGUS FERRUGINEA. *F. foliis ovato-acuminatis, grosse dentatis; nuce duæ triquetra, calyce echinato, coriáceo, quadrifido, incluse.*

THIS species of Beech is almost exclusively confined to the northeastern parts of the United States, and to the provinces of Canada, New Brunswick, and Nova Scotia. In the district of Maine, and in the States of New Hampshire and Vermont, it is so abundant as often to constitute extensive forests, the finest of which grow on fertile, level, or gently-sloping lands, which are proper for the culture of corn. Its name is derived from the color of its wood and not of its leaves, as might be supposed in Europe, where a species with dull red and sometimes with purple foliage is cultivated in the gardens.

The Red Beech bears a greater resemblance to that of Europe than to the kindred American species: it equals the White Beech in diameter, but not in height; and, as it ramifies nearer the earth, and is more numerously divided, it has a more massive summit and the appearance of more tufted foliage. Its leaves are equally brilliant, a little larger and thicker, and have longer teeth. Its fruit is of the same form, but is only half as large, and is garnished with firmer and less numerous points. To these differences must be added a more important one in the

wood: a Red Beech fifteen or eighteen inches in diameter consists of three or four inches of sap and thirteen or fourteen inches of heart, the inverse of which proportion is found in the White Beech.

The wood of the Red Beech is stronger, tougher, and more compact. In the district of Maine and in British America, where the Oaks are rare, it is employed with the Sugar Maple and Yellow Birch for the lower part of the frame of vessels. As it is extremely liable to injury from worms, and speedily decays when exposed to alternate dryness and moisture, it is rarely used in the construction of houses. In the district of Maine, the Hickories are rare and the White Oak does not exist, and, when the Yellow Birch and Black Ash cannot be procured in sufficient abundance, the Red Beech is selected for hoops.

This wood is brought to Boston for fuel, but it is less esteemed and is sold at a lower price than the Sugar Maple. It serves for shoe-lasts and the handles of tools, and is especially proper for the tops of cards, because, when perfectly seasoned, it is not liable to warp. It is brought from the river Hudson to Philadelphia for the same uses. I have been informed by mechanics in that city, employed in making plane-handles of the Red Beech, that it is sometimes equal, though usually inferior, in compactness and solidity, to the European Beech.

Red Beech planks about three inches thick are exported to Great Britain, for purposes which I am unable to particularize; but, whatever may be the consumption, the American forests are extensive enough to supply for a long time the demands of commerce.

The European Beech bears so strict an analogy to the Red Beech, that it may be useful to take notice of its properties, its uses, and the means by which its duration is insured in important structures.

Experience has demonstrated the advantage of felling the

Beech in the summer, while the sap is in full circulation: cut at this season, it is very durable, but felled in the winter, it decays in a few years. The logs are left several months in the shade before they are hewn, care being taken that they do not rest immediately upon the ground; after which they are fashioned according to the use to which they are destined, and laid in water for three or four months. They are said to be rendered in this way inaccessible to worms.

The Beech is very durable when preserved from humidity, and incorruptible when constantly in the water; but it rapidly decays when exposed to alternations of dryness and moisture.

In Europe, where there are not as many trees as in North America with durable and elegant wood, such as the Birches and the Maples, we are dependent upon the Beech for a greater variety of uses. It is employed for tables and bedsteads, for screws, rollers, pestles, dishes, wooden shoes, corn-shovels, &c.; in the north of France it is taken for the felloes of wheels, and it was formerly used, instead of pasteboard, in bookbinding. In the valley of Saint-Jean-pied-de-port, in the Pyrenees, oars are made of it to supply the neighboring ports of the ocean. While the wood retains a portion of its sap, they are pliant and elastic; but for this use no tree can stand in competition with the Black Ash of the United States. Though the Beech is rapidly consumed, it is highly esteemed as a combustible, and its ashes are rich in alkali.

In certain cantons of Belgium, particularly near the village of St. Nicholas, between Ghent and Antwerp, very solid and elegant hedges are made with young Beeches, placed seven or eight inches apart and bent in opposite directions so as to cross each other and form a trellis with apertures five or six inches in diameter. During the first year they should be bound with osier at the points of intersection, where they finally become grafted and grow together. As the Beech does not suffer in

pruning, and sprouts less luxuriantly than most other trees, it is perfectly adapted to this object. In the compendium at the close of my work will be found a more particular description of these hedges, which are highly interesting to the farmers of the Northern and Middle States. In the country of *Caux* and in other parts of Normandy, the farms and noblemen's seats are surrounded with Beeches; and curtains of foliage are here and there seen diversifying the landscape, which always enclose a human habitation. Planted in a straight line, and breathing an unconfined air, they grow with greater rapidity, and form a lofty and superb trunk.

The young Beech delights in shady situations and requires a soil unincumbered with herbage.

In France and Germany an oil is extracted from the beech-nut which is next in fineness to that of the olive. The forests of Eu and of Cr cy in the Department of the Oise have yielded in a single season more than a million sacks* of this fruit, and in 1779 the forests of Compi gne, near Verberie, Department of the Somme, afforded oil enough to supply the wants of the district for more than half a century.

The beech-nuts are of a triangular form, with a smooth, tough skin, and a fine inferior pellicle adhering to the kernel. They are united in pairs in capsules garnished with soft points, from which they escape about the 1st of October, the season of their maturity.

The oil is abundant only when the fruit is perfectly ripe. The season for extracting it is from the beginning of December to the end of March: if the operation is longer delayed, the nuts are liable to be injured by the warmth of the season.

The skin is commonly ground with the kernel; but, as the product in this way diminishes a seventh, it would be more advantageous to separate them, which might be done in a flour-

* A sack contains about two bushels.

mill properly adjusted. The kernel should be immediately reduced to a paste by a vertical stone or by a pestle-mill. As the paste becomes dry in the process, water is added in the proportion of one pound to fifteen pounds of fruit, to prevent its being impaired by the heat.

The paste is sufficiently reduced when the oil is discharged by the pressure of the hand. It is submitted to the press in sacks of coarse linen, of wool, or of hair, and the force is gradually applied and long continued, so that the oil may be completely distilled: three hours at least are required in an ordinary press. To prepare the paste for a second pressure, it is pulverized, a proportion of water being added smaller than at first, and the whole is warmed by the careful application of a moderate heat. A *wedge-press* is commonly employed in the second operation.

With skill in the process, the oil is equal to one-sixth of the fruit. Its quality depends upon the care with which it is made, and upon the purity of the vessels in which it is preserved. It should be twice drawn off during the first three months without disturbing the dregs, and a third time at the end of six months: it arrives at perfection only when it becomes limpid, several months after its extraction. It improves by age, lasts unimpaired for ten years, and may be preserved longer than any other oil.

PLATE CVII.

A branch with leaves and fruit of the natural size. Fig. 1. A nut.

AMERICAN HORNBEAM.

CARPINUS AMERICANA. *C. foliis oblongo-ovalibus, serratis, involucriorum lanceolatis acute dentatis.*

THE American Hornbeam is found as far north as the provinces of Nova Scotia, New Brunswick, and Lower Canada; but it is repressed by the severity of the climate, and is less multiplied than in New Jersey, Pennsylvania, and the Southern States. By the Americans it is called Hornbeam, and by the French of Upper Louisiana, *Charme*.

The Hornbeam prospers in almost every soil and exposure, except in places that are too long inundated, or that are absolutely sterile, like the pine-barrens of the Southern States and of the Floridas. Its ordinary stature is from twelve to fifteen feet, and it is sometimes twenty-five or thirty feet high and six inches in diameter; but, as not more than one stock in a hundred attains these dimensions, it must be considered rather as a large shrub than as a tree. I have admitted it among the trees because it is met with at every step in the forests.

The leaves of the Hornbeam are oval-acuminate and finely denticulated. The sexes are united on the same stock, and the fertile flowers are collected in long, loose, pendulous, leafy aments at the extremity of the branches. The scales or leaves which surround them are furnished at the base with a hard, oval seed. The fructification is always abundant, and the aments remain attached to the tree long after the foliage is shed.

The trunk of the American Hornbeam, like that of the analogous species in Europe, is obliquely and irregularly fluted, frequently through all its length. By its form and the appearance of the bark, which is smooth and spotted with white, it is easily distinguished when the leaves are fallen.



Bacca del

Catkin 1859

Hornbeam.
Carpinus virginiana.



H. J. Redouté del.

G. B. S. sculp.

Iron Wood.
Carpinus ostrya

The wood, like that of the European Hornbeam, is white, and exceedingly compact and fine-grained. The dimensions of the tree are so small as to render it useless even for fuel; but it is employed for hoops in the district of Maine when better species cannot be procured.

From these particulars it will readily be concluded that we have no interest in propagating the American Hornbeam in Europe, as our own species possesses equal strength and solidity, attains the height of thirty-five or forty feet, with a diameter of fifteen or eighteen inches, and is consequently applicable in the mechanical arts and useful for fuel. The only superiority of the American species is for trellises; as it is naturally dwarfish, its growth is more easily repressed, and, as its branches are numerous, it has a closer and more tufted foliage. The Hornbeam of Europe, on the other hand, would be a valuable acquisition to the forests of America.

PLATE CVIII.

A branch with leaves and fruit of the natural size. Fig. 1. A seed.

IRON WOOD.

CARPINUS OSTRYA. *C. foliis cordato-ovalibus; amentis femineis oblongioribus; involucris fructiferis, compresso-vesicariis.*

EAST of the Mississippi the Iron Wood is diffused throughout the United States and the provinces of New Brunswick, Nova Scotia, and Lower Canada. In New York, New Jersey, Pennsylvania, and the Southern States, where it is most abundant, it bears the name which I have adopted; in Vermont, New Hamp-

shire, and the district of Maine, it is called Lever Wood, and by the French of Illinois, *Bois dur*, "hard wood."

Though the Iron Wood is multiplied in the forests, it nowhere constitutes masses even of inconsiderable extent, but is loosely disseminated, and found only in cool, fertile, shaded situations. I have nowhere seen it more common nor more vigorous than in Genesee, near Lake Erie and Lake Ontario; but it is always a tree of the second or even of the third order, rarely equalling thirty-five or forty feet in height and twelve or fifteen inches in diameter, and commonly not exceeding half these dimensions.

The leaves are alternate, oval-acuminate, and finely and unequally denticulated. The fertile and barren flowers are borne at the extremity of different branches of the same tree, and the fruit is in clusters like hops. The small, hard, triangular seed is contained in a species of reddish, oval, inflated bladder, covered at the age of maturity with a fine down, which causes a violent irritation of the skin if carelessly handled.

In the winter this tree is recognised by a smooth, grayish bark, finely divided, and detached in strips not more than a line in breadth.

The wood is perfectly white, compact, fine-grained, and heavy. The concentric circles are closely compressed, and their number in a trunk of only four or five inches in diameter evinces the length of time necessary to acquire this inconsiderable size. To its inferior dimensions must be ascribed the limited use of a tree, the superior properties of whose wood are attested by its name. In the Northern States, and particularly in the district of Maine, the Iron Wood is used for the levers with which the trees felled in clearing the ground are transported to the piles on which they are consumed. Near New York, brooms and scrubbing-brushes are made of it, by shredding the end of a stick of suitable dimensions. Though its uses are unimportant, they might probably be more diversified: it seems well adapted for mill-cogs, mallets, &c.



V. Beck del.

L. C. C. sc.

Black Gum.
Nyssa sylvatica.

The Iron Wood flourishes in France: several stocks, fifteen or twenty feet in height, fructify annually on the ancient estate of Duhamel-Dumonceau, and young plants, the produce of self-sown seeds, are found in the vicinity.

This species is among the exotic trees which might be propagated with advantage in Europe.

PLATE CIX.

A branch with leaves and fruit of the natural size. Fig. 1. A seed.

BLACK GUM.

NYSSA SYLVATICA. N. foliis ovalibus, integerrimis, petiolo, nervo medio, margineque villosis; pedunculis femineis longis plerumque 2-floris, nuce brevi, obovatâ, obtusè striatâ.

Polygamia diœcia. LINN. Elœagnoides. JUSS.

IN the park of Mr. W. Hamilton, at the Woodlands, near Philadelphia, I first observed the Black Gum. The river Schuylkill in this vicinity may be assumed as its northern boundary, though it is common in the woods on the road from Philadelphia to Baltimore. In all the more Southern States, both east and west of the Alleghany Mountains, it is more or less multiplied as the soil is more or less favorable to its growth. It is designated by the names of Black Gum, Yellow Gum, and Sour Gum, neither of which is founded upon any of its characteristic properties; but as they have become sanctioned by use, however ill-chosen, I have adopted the first, which is the most common.

The vegetation of this tree exhibits a remarkable singularity: in Maryland, Virginia, and the Western States, where it grows on high and level grounds with the Oaks and the Walnuts, it is distinguished by no peculiarity of form; in the lower part of the Carolinas and of Georgia, where it is found only in wet places with the Small Magnolia or White Bay, the Red Bay, the Loblolly Bay, and the Water Oak, it has a pyramidal base resembling a sugar-loaf. A trunk eighteen or twenty feet high and seven or eight inches in diameter at the surface is only two or three inches thick a foot from the ground; these proportions, however, vary in different individuals.

The Black Gum is much superior in size to the Tupelo, being frequently sixty or seventy feet high and eighteen or twenty inches in diameter. I have observed that on elevated and fertile lands in the upper part of Virginia, in Kentucky and Tennessee, it is larger than in marshy grounds in the maritime parts of the Southern States.

The leaves of this species are five or six inches long, alternate, entire, of an elongated oval form, and borne by short and downy petioles. The flowers are small, not conspicuous, and collected in bunches. The fruit is of a deep blue color and of a lengthened oval shape, and contains a slightly convex stone, longitudinally striated on both sides.

The bark of the trunk is whitish and similar to that of the young White Oak. The wood is fine-grained but tender, and its fibres are interwoven and collected in bundles; an arrangement characteristic of the genus. The alburnum of stocks growing upon dry and elevated lands is yellow; this complexion is considered by wheelwrights as a proof of the superior quality of the wood, and has, probably, given rise to the name of Yellow Gum, which is sometimes given to this species. Throughout the greater part of Virginia, the Black Gum is employed for the naves of coach and wagon-wheels; at Richmond, Baltimore, Philadelphia, &c., it is preferred for hatters' blocks, as being less



Fruct. del.

Gambel & Co.

Tupelo.
Nyssa aquatica

liable to split; and in the Southern States it is used in the rice-mills for the cylinder which receives the cogs by whose revolution the pestles are lifted and dropped upon the rice to separate it from the husk. The teeth are driven into mortices formed in the wood, and are strongly compressed by the reaction of its interwoven fibres. For its difficulty in splitting, the Black Gum is chosen by shipwrights for the *cap*, or the piece which receives the topmast.

Such are the most important uses of this wood, which are equally well subserved by that of the Tupelo. Both species support the temperature of Paris, but they succeed better a few degrees farther south.

PLATE CX.

A branch with leaves and fruit of the natural size. Fig. 1. A stone separated from the pulp.

TUPELO.

NYSSA AQUATICA. N. foliis ovalibus, integerrimis; pedunculis femineis bifloris; drupa brevi, obovata; nuce striata.

THE Tupelo begins to appear in the lower part of New Hampshire, where the climate is tempered by the vicinity of the sea; but it is most abundant in the southern parts of New York, New Jersey, and Pennsylvania. It is called indiscriminately Tupelo, Gum Tree, Sour Gum, and Peperidge; names of whose origin and meaning I am ignorant. The first of these denominations is the most common; the second is wholly misapplied, as no self-condensing fluid distils from the tree; and the

third is used only by the descendants of the Dutch settlers in the neighborhood of New York.

The Tupelo grows only in wet grounds; in New Jersey it is constantly seen on the borders of the Swamps with the Sweet Gum, the Swamp White Oak, the Chestnut White Oak, and the White Elm. It rarely exceeds forty or forty-five feet in height, and its limbs, which spring at five or six feet from the ground, affect a horizontal direction. I have remarked that the shoots of the two preceding years are commonly simple, and widely divergent from the branches. The trunk is of a uniform size from its base: while it is less than ten inches in diameter the bark is not remarkable, but on full-grown and vigorous stocks it is thick, deeply furrowed, and, unlike the bark of any other tree, divided into hexagons, which are sometimes nearly regular.

The leaves are three inches long, oboval, smooth, slightly glaucous beneath, alternate, and often united in bunches at the extremity of the young lateral shoots. The flowers are small, scarcely apparent, collected in bunches, and supported by petioles one or two inches in length. The fruit, which is always abundant, is of a deep blue color, about the size of a pea, and attached in pairs. It is ripe toward the beginning of November, and, persisting after the falling of the leaf, forms a part of the nourishment of the red-breasts in their autumnal migration to the South. The stone is compressed on one side, a little convex on the other, and longitudinally striated. Bruised in water, this fruit yields an unctuous, greenish juice, of a slightly bitter taste, which is not easily mingled with the fluid. I do not know that any attempt has been made to convert it into economical uses; and I believe it would be difficult to obtain from it a spirituous liquor, or even to convert it into vinegar.

The Tupelo holds a middle place between trees with soft and those with hard wood. When perfectly seasoned, the sap is of a light reddish tint, and the heart of a deep brown. Of stocks

exceeding fifteen or eighteen inches in diameter, more than half the trunk is hollow; a fact which I have repeatedly witnessed.

The ligneous fibres which compose the body of trees in general are closely united, and usually ascend in a perpendicular direction. By a caprice of nature which it is impossible to explain, they sometimes pursue an undulating course, as in the Red and Sugar Maples, or, as in the last-mentioned species, form rippings so fine that the curves are only one, two, or three lines in diameter; or, lastly, they ascend spirally, as in the *Orme tortillard*, Twisted Elm, following the same bent for four or five feet. In these species, however, the deviation is only accidental, and to be sure of obtaining this form it must be perpetuated by grafting or by transplanting young stocks from the shade of the parent tree. The genus which we are considering exhibits, on the contrary, a constant peculiarity of organization: the fibres are united in bundles, and are interwoven like a braided cord; hence the wood is extremely difficult to split unless cut into short billets. This property gives it a decided superiority for certain uses; in New York, New Jersey, and particularly at Philadelphia, it is exclusively employed for the naves of wheels destined for heavy burdens. It must be acknowledged that, in some parts of New Jersey and Pennsylvania, the White Oak is preferred, which, as I have already remarked, appears, from its liability to split, to be little calculated for this object. From the difference of opinion on this subject, we may conclude that the Tupelo is esteemed solely for its difficulty in splitting, and not for its solidity and strength. The absence of these properties would be a still more essential defect in France, where the wheels of heavy vehicles have naves twenty inches in diameter at the insertion of the spokes, with an axle-tree of 350 pounds' weight, and are laden for distant transportation with 9000 pounds, which is twice the burden ever laid upon them in America. The Tupelo, therefore, from its inferiority in size and strength, can never be substituted for

the Twisted Elm. But if to its own organization it joined the solidity of the Elm, a more rapid vegetation, and the faculty of growing on dry and elevated lands, and of expanding to three or four times its present dimensions, it would be the most precious to the mechanical arts of all the forest-trees of Europe and North America. In New Jersey and Pennsylvania, many farmers prefer the Tupelo for the side-boards and bottom of carts, as experience has evinced its durability. Wooden bowls are made of it, which are heavier than those of Poplar, but less liable to split. As a combustible, it is esteemed for consuming slowly and diffusing a great heat: at Philadelphia, many persons, in making their provision of wood for the winter, select a certain proportion of the Tupelo, which is sold separately for logs.

The preceding remarks will enable the Europeans to appreciate the value of the Tupelo, while they suggest to the Americans the importance of introducing the Twisted Elm.

PLATE CXI.

A branch with leaves and fruit of the natural size. Fig. 1. A stone separated from the pulp.

LARGE TUPELO.

NYSSA GRANDIDENTATA. N. foliis longe petiolatis, ovalibus, acuminatis; pedunculis femineis 1-floris; fructibus cæruleis.

THIS is the most remarkable species of its genus for height and diameter. According to my own observations, it is unknown to the Northern and Middle States, and is found only in the lower part of the Carolinas, of Georgia, and of East



Nyssa del.

del. G. P.

Large Tupelo.
Nyssa grandidentata.

Florida, where it is designated by the name of Large Tupelo. I have been assured that it abounds, also, in Lower Louisiana on the banks of the Mississippi, where it is called Wild Olive. In fine, it exists in all parts of the United States which produce the Long-leaved Pine. I am induced also to believe, though with less conclusive evidence of the fact, that it grows wherever we find the Cypress; and, consequently, that it extends north beyond the limits of Virginia, as the Cypress abounds in the swamps of Maryland, at a little distance from the sea. In South Carolina and Georgia, I have seen them constantly united, and, with the Over-cup Oak, Water Locust, Cotton Wood, Carolinian Poplar, and Water Bitternut Hickory, they compose the dark and impenetrable forests which cover the miry swamps on the border of the rivers, to the distance of one or two hundred miles from the ocean. The extensive swamps still enclosed in the forests produce the same trees, whose presence is an infallible proof of the depth and fertility of the soil, and, consequently, of its fitness for the culture of rice.

The rivers, at their annual overflowing, sometimes cover these marshes to the height of five or six feet, as is shown by the marks left upon the trees by the retiring waters. Vegetation seems only to acquire new energy from these inundations; and the Large Tupelo sometimes attains the height of seventy or eighty feet, with a diameter of fifteen or twenty inches immediately above its conical base, and six or seven feet from the ground. This size continues uniform to the height of twenty-five or thirty feet: at the surface the trunk is eight or nine feet thick, which is a greater disproportion than we observed in the preceding species.

I cannot attribute this extraordinary swelling of the trunk entirely to the humidity of the soil; if such was the cause we would probably witness the phenomenon in other trees which accompany the Tupelo.

The leaves of the Large Tupelo are commonly five or six

inches long and two or three inches broad; on young and thriving stocks they are of twice these dimensions. They are of an oval shape, and are garnished with two or three large teeth, irregularly placed, and not opposite, like those of other leaves. At their unfolding in the spring they are downy, but they become smooth on both sides as they expand. The flowers are disposed in bunches, and are succeeded by a fruit of considerable size and of a deep blue complexion, of which the stone is depressed and very distinctly striated. Bruised in water, this fruit yields a fine purple juice, of which the color is tenacious; but the quantity is too minute to afford resources in dyeing.

The wood of the Large Tupelo is extremely light, and softer than that of any tree of the United States with which I am acquainted. In the arrangement of its fibres it resembles the other species of the genus. Its only use is for bowls and trays, for which it is well adapted, as it is wrought with facility. Its roots, also, are tender and light, and are sometimes employed by fishermen to buoy up their nets: but no part of the tree affords a substitute for cork.

The only merit of this species consists in its agreeable form and beautiful foliage. It endures the temperature of Paris, and does not exact in Europe as moist a soil as it constantly requires in the United States.

PLATE CXII.

A branch with leaves and fruit of the natural size. Fig. 1. A stone separated from the pulp.



Bacca del

valer

Sour Tupelo.
Nyssa capitata.

SOUR TUPELO.

NYSSA CAPITATA. *N. foliis brevissime petiolatis, subcuneato-oblongis, subtus subcandicantibus; pedunculis femineis 1-floris; fructibus rubris.*

THE Sour Tupelo first makes its appearance on the river Ogeechee, near the road from Savannah to Sunbury, and in going southward it is seen in every favorable situation. I have been told that it exists in Lower Louisiana, which is probable, from the analogy in soil and climate between the early Southern States and the country watered by the lower part of the Mississippi.

In Georgia, this tree is known by the names of Sour Tupelo and Wild Lime, the first of which I have preferred, though the last is more common, because this vegetable bears no resemblance to the Lime-tree in the form of its leaves or of its flowers.

The leaves are five or six inches long, oval, rarely denticulated, of a light green above and glaucous beneath. The flowers are similar to those of the Large Tupelo, but the sexes are borne by separate stocks; and I have remarked, as a peculiarity witnessed in no other tree of North America, that the male and female trees are easily distinguished by their general appearance when the leaves are fallen. The branches of the male are more compressed about the trunk, and rise in a direction more nearly perpendicular: those of the female diffuse themselves horizontally and form a larger and rounder summit.

The fruit is supported by long petioles, and is from fifteen to eighteen lines in length, of a light red color and of an oval shape. It is thick-skinned, intensely acid, and contains, like that of the Large Tupelo, a large oblong stone deeply channelled on both sides. An agreeable acidulous beverage might be made

of it; but the Lime-tree, which is found in the same country, is superior in the size and abundance of its fruit, and has, besides, the advantage of flourishing on barren, sun-beaten lands.

This species is the smallest of the Tupelos, being rarely more than thirty feet high and seven or eight inches in diameter. It accompanies the Large Tupelo in the swamps which are found upon the borders of the rivers or in the midst of the forests. As its wood is soft and its dimensions too small to be applicable in the arts, it falls exclusively within the province of the amateurs of exotic plants.

PLATE CXIII.

A branch with leaves and fruit of the natural size. Fig. 1. A stone separated from the pulp.

AMERICAN NETTLE TREE.

CELTIS OCCIDENTALIS. *C. foliis ovatis, acuminatis, serratis, basi inæqualibus, supra scabris, subtus hirtis; fructibus rubris.*

Polygamia dioecia. LINN. Amentaceæ. JUSS.

THE American Nettle-tree, if not rare, is little multiplied in comparison with the Oaks, the Walnuts, and the Maples. As it is scattered singly through the forests, it is difficult to fix the point at which it ceases toward the north; but I believe it is not found beyond the river Connecticut. In the Middle, Western, and Southern States, it bears the name which I have adopted, and, among the French of Illinois, that of *Bois inconnu*, "unknown wood."



H. J. Redman del.

G. B. S. ex.

American Nettle Tree
Celtis occidentalis

The Nettle-tree prefers a cool and shady situation, with a deep and fertile soil: I have observed the largest stocks on the banks of the Savannah, some of which were sixty or seventy feet high and eighteen or twenty inches in diameter. This species is similar in its foliage and general appearance to the European Nettle-tree; the branches of both are numerous and slender, and the limbs take their rise at a small distance from the ground and seek a horizontal or an inclined direction. The leaves are alternate, about three inches long, of a dark green color, oval-oblique at the base, very acuminate at the summit, denticulated, and somewhat rough. The flowers open early in the spring, and are small, white, single, and axillary: the fruit, also, is small and single, of a round form, and of a dull red color.

The bark is rough and entire upon the trunk, and smooth and even on the secondary branches. I have never seen the wood employed in any part of the United States, and cannot speak of its uses: as the American and European species are analogous in other respects, they are probably alike in the properties of their wood.

The European Nettle-tree is a robust vegetable, which endures the most inclement weather, bears transplanting without injury, and grows with rapidity in almost every soil. When perfectly seasoned, the wood is of a dark brown color, hard, compact, supple, and tenacious: it makes excellent hoops, whip-stocks, and ramrods, is used by wheelwrights for shafts and for other purposes, and is proper for sculpture. The ancients assert that it is durable and secure from worms.

PLATE CXIV.

A branch with leaves and fruit of the natural size. Fig. 1. A sprig with flowers.

[See Nuttall's Supplement, vol. i. p. 149.]

[Douglas found the Nettle-tree on the banks of the Columbia River, in places of extreme dryness; and Emerson asserts that he has discovered it in almost every county of Massachusetts, although everywhere so rare, that its name is unknown to the inhabitants. It bears so striking a resemblance to the Elm as sometimes to be called False Elm. Torrey, who gives it the name of Beaver Wood and Hoop Ash, says it is to be found particularly in rocky situations, on the banks of rivers. Loudon says the root of the European Nettle-tree furnishes a yellow dye, and that an oil is expressed from the stones of the fruit.]

HACK BERRY.

CELTIS CRASSIFOLIA. *C. foliis subcordatis, serratis, acuminatis; fructibus nigris.*

THE banks of the Delaware, above Philadelphia, may be considered as the northeastern limits of the Hack Berry. East of the mountains, it is restricted within narrow boundaries, and is a stranger to the lower part of Virginia and to the more Southern States: I have found it abundant only on the banks of the Susquehanna and of the Potomac, particularly on the Susquehanna near Columbia and Harrisburg. It is profusely multiplied, on the contrary, in the Western country in all the valleys that stretch along the rivers, and wherever the soil is fertile throughout Kentucky and Tennessee. On the Ohio, from Pittsburg to Marietta, it is called Hoop Ash, and in Kentucky, Hack Berry; a name whose origin I am unable to trace.

This is one of the finest trees that compose the dusky forests on this part of the Ohio. It associates with the Buttonwood, Black Walnut, Butternut, Bass Wood, Black Sugar Maple, Elm,



W. J. Redman del.

Robert J.

Hack Berry.
Celtis crassifolia.

and Sweet Locust, which it equals in stature but not in bulk, being sometimes more than eighty feet high, with a disproportionate diameter of eighteen or twenty inches.

The Hack Berry is easily distinguished by the form of its trunk, which is straight and undivided to a great height, and by its bark, which is grayish, unbroken, and covered with asperities unequally distributed over its surface. Its leaves are larger than those of any other species of Nettle-tree, being six inches long and three or four inches broad. They are oval-acuminate, denticulated, cordiform at the base, of a thick, substantial texture, and of a rude surface. The flowers are small, white, and often united in pairs on a common peduncle. The fruit is round, about as large as a pea, and black at its maturity. The wood is fine-grained and compact, but not heavy, and when freshly exposed it is perfectly white: sawn in a direction parallel or oblique to its concentric circles, it exhibits the fine undulations that are observed in the Elm and the Locust. On laying open the sap of this tree in the spring, I have remarked, without being able to account for the phenomenon, that it changes in a few minutes from pure white to green. On the Ohio and in Kentucky, where the best opportunity is afforded of appreciating this wood, it is little esteemed, on account of its weakness and its speedy decay when exposed to the weather. It is rejected by wheelwrights, but is sometimes employed in building for the covering which supports the shingles. As it is elastic and easily divided, it is used for the bottom of common chairs, and by the Indians for baskets. On the banks of the Ohio, it is frequently taken for the rails of rural fences, and is wrought with the greatest ease, as it is straight-grained and free from knots; it is said also to afford excellent charcoal.

The Hack Berry is certainly one of the most beautiful trees of its genus, and one of the most remarkable for height and for majesty of form. In rich soils the luxuriance of its vegetation is shown by sprouts six, eight, and ten feet in length, garnished

on each side with large, substantial leaves. In France, it is principally esteemed for the rapidity of its growth; and it is to be wished that its wood may be found valuable enough to entitle it to a place in our forests.

PLATE CXV.

A branch with leaves and fruit of the natural size.

[Emerson has found the Hack Berry in Massachusetts, on the banks of the Connecticut River, but it is rare.]

RED MULBERRY.

MORUS RUBRA. *M. foliis cordatis, orbiculatis trilobisve, æqualiter serratis, scabris; spicis femineis cylindricis.*

Monœcia tetrandria. LINN. Urticæ. JUSS.

THE northern extremity of Lake Champlain and the banks of the river Connecticut, which I have assigned as the limits of the Tulip-tree, may also be assumed as those of the Red Mulberry. As a temperate climate is favorable to its increase, it is more multiplied farther south; but in the Atlantic States it is proportionally less common than many other trees which still do not constitute the mass of the forests: the Sweet Gum, the Tulip-tree, the Sassafras, the Red Beech, and the Maples, are far more abundant.

In the lower part of the Southern States, this tree is much less frequently seen than at a distance from the sea, where the soil and vegetable productions wear a different character. I have found it most abundant in the States of Ohio, Kentucky,



Brown del.

Gable sc.

Red Mulberry
Morus rubra.

and Tennessee, and on the banks of the Wabash, the Illinois, and the Missouri; which is attributable to the superior fertility of the soil. In these regions, and in the upper part of Pennsylvania and Virginia, the Red Mulberry often exceeds sixty or seventy feet in height and two feet in diameter. Its leaves are large, sometimes entire and sometimes divided into two or three lobes, rounded, cordiform, and denticulated, of a dark green color, a thick texture, and a rough, uneven surface.

The sexes are usually separate, though sometimes they are found upon the same tree. The male flowers form pendulous, cylindrical aments, about an inch in length; the female blossoms are small and scarcely apparent. The fruit is of a deep red color, an oblong form, and an agreeable, acidulous, sugary taste; it is composed by the union of a great number of small berries, each of which contains a minute seed.

The trunk of the Red Mulberry is covered with a grayish bark, more furrowed than that of the Oaks and Hickories. The perfect wood is of a yellowish hue, approaching to lemon-color. The concentric circles are distant and distinct; the wood is, nevertheless, fine-grained and compact, though lighter than that of the White Oak. It possesses strength and solidity; and, when perfectly seasoned, it is almost as durable as the Locust, to which, by many persons, it is esteemed perfectly equal. At Philadelphia, Baltimore, and in the more southern ports, as much of it as can be procured is employed for the upper and lower parts of the frame of vessels, for the knees, the floor-timbers, and, in preference to every other wood except the Locust, for tree-nails. But it grows more slowly, requires a richer soil, and is less multiplied, than the Locust, and it is found in the ship-yards in a smaller proportion than any other timber. In South Carolina, it is selected for the ribs of the large boats in which the productions of the upper districts of both Carolinas are brought down the Catawba. For posts it is almost as durable and as much esteemed as the Locust. Such are its

most important uses, which should engage the American proprietors to preserve with care the stocks growing naturally on their estates.

It is a common opinion among shipwrights and carpenters, that the wood of the male Mulberry is more durable and of a better quality than that of the female: I must be pardoned for considering this opinion as a prejudice, till experiments have demonstrated its truth. In America, as well as in Europe, unlearned people fall into the same error concerning the Mulberry-tree as concerning Hemp,—of giving the name of male to the productive and of female to the barren plant, so that, if a difference is shown to exist, it is the female tree which affords the best timber.

The Black Mulberry of Europe, which bears a great resemblance to the Red Mulberry, and whose fruit is three or four times as large, would be a valuable acquisition to the Middle and still more to the Western States, where it would flourish in perfection. The fruit of the American species, too, might easily be augmented in size and quantity by careful cultivation: a very sensible improvement is witnessed in trees left standing in cultivated fields.

As the leaves of both these species are thick, rough, and hairy while young, they are improper for the nourishment of silk-worms, which feed only on the smooth, thin, tender foliage of the White Mulberry. On several deserted plantations, fifteen or twenty miles from Savannah, are seen large White Mulberries, which were set out a century ago, when attempts were made to introduce the raising of silk-worms. Experience quickly detected the error of the calculation: this branch of industry is adapted only to a populous country, where there are hands not required for the cultivation of the earth that may be employed in manufactures so as to afford their products at moderate prices. In the United States this period is still remote; the extensive and scarcely-inhabited regions of Upper Louisiana, favored with



H. J. Rodenri del.

G. B. S. sculp.

Sweet Leaf.
Hloea tinctoria.

a fertile soil and a genial climate, will offer resources to the redundant population of the Atlantic and Western States. These regions will probably produce the finest silk, as their soil and climate are peculiarly adapted to the White Mulberry.

The Red Mulberry has been cultivated for many years in France and England, where it succeeds perfectly, and is esteemed for its thick and shady foliage. The excellent properties of its wood should induce the Europeans to propagate it in their forests.

PLATE CXVI.

A branch with leaves and fruit of the natural size. Fig. 1. A young shoot with a barren ament. Fig. 2. A barren flower detached from the ament.

SWEET LEAF.

HOPEA TINCTORIA. *H. foliis lanceolato-ovatis, subserratis, nitidis; floribus luteis; fructibus cæruleis.*

Polyadelphia polyandria. LINN. Guaiacaneæ. JUSS.

I FIRST observed the Sweet Leaf near Petersburg in Virginia. It is common in West Tennessee and in the upper part of the Carolinas and of Georgia; but it is still more abundant within the limits which I have assigned to the pine-barrens, where the soil is light and the winter less rigorous than at a greater distance from the sea.

This tree is known only by the name of Sweet Leaf. It varies in size according to the situation in which it grows: on the banks of the Savannah and on the borders of the large swamps, where the soil is deep, loose, and fertile, I have seen it twenty-five or thirty feet high, and seven or eight inches in diameter at the height of five feet. Commonly it does not exceed half

these dimensions, and in the pine-barrens, where it is profusely multiplied, it is sometimes only three or four feet in height. The sprouts from the trunks consumed in the annual conflagration of the forests never surpass this height, and, as they do not fructify, the tree is multiplied by its running roots, which shoot at the distance of a few feet.

The trunk of the Sweet Leaf is clad in a smooth bark, and, if wounded in the spring, distils a milky fluid of an unpleasant odor. The wood is not hard, and is totally useless. The leaves are three or four inches long, smooth, thick, alternate, of an elongated oval shape, slightly denticulated, and of a sugary taste. In sheltered situations they persist during two or three years, but in the pine-barrens they turn yellow with the first frost, and fall toward the beginning of February. In the mean time they are eagerly devoured by horses and cows turned loose into the forests after the herbage has perished.

The flowers spring from the base of the leaves, and appear early in the season: they are yellowish, sweet-scented, and composed of a great number of stamina shorter than the petals and united in separate groups at the base. The fruit is cylindrical, minute, and of a deep blue color at its maturity.

The foliage is the only part of this tree which promises to be of any utility; when dry, it affords, by decoction, a beautiful yellow color, which is rendered permanent by the addition of a little alum, and is used to dye wool and cotton. But, if these leaves had possessed any considerable value, they would doubtless have found their way into commerce. The first obstacle to their use is the expense, in a country where labor is dear, of collecting them in sufficient quantities. Of this I can judge from the difficulty I experienced in gathering a few pounds.

PLATE CXVII.

A branch with leaves and flowers of the natural size. Fig. 1. A young shoot with fruit of the natural size.

A S H E S.

EXCEPT the Oak, no tree of Europe or of North America is so generally useful as the Ash. The distinguishing properties of its wood are strength and elasticity; and it unites them in so high a degree, that, for many valuable purposes, it could be but imperfectly replaced by any other tree. This remark is particularly applicable to the Common Ash of Europe and to the White Ash of the United States, which are the largest species, the most multiplied, and the most useful in the arts.

Eight species of Ash are mentioned by botanists as indigenous to Europe; and a much greater number exist in America, as I am convinced by my own observations, and by examples, contained in my father's herbarium or cultivated in our gardens and nurseries, of species which escaped my researches in America. Probably more than thirty species will be found east of the Mississippi.

As a close analogy reigns throughout this genus, each species should be raised from the seed, in order to study the development of its vegetation as well as the characters of its flowers and its fruit. By observing them while young, we shall be able to ascertain the comparative rapidity of their growth. My residence in the United States was not long enough for the execution of this interesting task; I have confined myself, therefore, to the description of those species which are the most remarkable for their utility or for the form of their seeds.

[See Nuttall's Supplement, vol. ii. 124, *et seq.*]

[*Soil, Propagation, &c.* The Ash will grow in barren soils, and in the bleakest and most exposed situations, but in such will not attain a timber-like size. If planted by ditch-sides, or in low boggy situations, according to Withering, the roots act as under-drains, and render the ground about them firm and hard; but Sang observes more correctly that the Ash is found in the highest perfection on dry, loamy soils, and that in moist but not wet soils it grows fast, but soon sickens; retentive clay soils do not agree with it. In rich soils its wood is short and brittle; in sandy soils it is tough and reedy, qualities which for several purposes much enhance its value. In loam mixed with decomposed rocks, at the bottom of a mountain where it is sheltered, the Ash arrives at a great size. The largest trees will be found where they have running water within reach of their roots. Marshall recommends the Ash to be planted alternately with the Oak, because, as the Ash draws its nourishment from the surface and the Oak from the subsoil, the ground would thus be fully and profitably occupied. It should undoubtedly be planted either along with its own species, or with other trees, so as to draw it up with a clear, straight stem, the value of the timber depending on the closeness and clearness of the grain.

The species is always propagated from seed, and the varieties by grafting or budding on the species. The seeds should be gathered and taken to the rotting-ground, mixed with light sandy earth, and laid in a heap of a flat form, not more than ten inches thick, in order to prevent them from heating. Here they should be turned over several times in the course of the winter, and in February they may be removed, freed from the sand by sifting, and sown in beds in any middling soil, well broken by the rake. The seeds may be deposited at the distance of half an inch every way, and covered a quarter of an inch with soil. The plants may be taken up at the end of the year, and planted in nursery-lines; and at the end of the second year they may be removed to where they are finally to remain.



Beck del.

Graham sculp.

White Ash.
Fraxinus americana.

The Weeping Ash, properly treated, is one of the most ornamental shrubby trees I have seen abroad. The limbs of a regular tree are pinned to the ground in a circle, and in a few years form an arbor of great beauty: a seat is placed around the stem.

The Golden-barked Ash and many other varieties are also an ornament to the shrubbery not to be neglected by the tasteful planter.]

WHITE ASH.

FRAXINUS AMERICANA.* *F. foliis integerrimis, longè acuminatis, petiolatis, subtùs glaucis.*

Polygamia diœcia. LINN. Jasminæ. JUSS.

THE White Ash is one of the most interesting among the American species for the qualities of its wood, and the most remarkable for the rapidity of its growth and for the beauty of its foliage. It abounds in New Brunswick and Canada; in the United States, it is most multiplied north of the river Hudson, and is more common in Genesee than in the southern parts of New York, in New Jersey, and Pennsylvania. A cold climate seems most congenial to its nature. It is everywhere called White Ash, probably from the color of the bark, by which it is easily distinguished. I have observed, too, that on large stocks the bark is deeply furrowed, and divided into small squares from one to three inches in diameter.

The situations most favorable to the White Ash are the banks of rivers and the edges and surrounding acclivities of swamps.

* [FRAXINUS ACUMINATA. Lam.]

It sometimes attains the height of eighty feet with a diameter of three feet, and is one of the largest trees of the United States. In the district of Maine and in the upper part of New Hampshire, it is always accompanied by the White Elm, Yellow Birch, White Maple, Hemlock Spruce, and Black Spruce; and in New Jersey it is mingled with the Red Maple, Shellbark Hickory, and Buttonwood, in places that are constantly wet and occasionally inundated.

The White Ash is a fine tree, with a trunk perfectly straight and often undivided to the height of more than forty feet. The leaves are twelve or fourteen inches long, opposite, and composed of three or four pair of leaflets surmounted by an odd one. The leaflets, which are borne by short petioles, are three or four inches long, about two inches broad, oval-acuminate, rarely denticulated, of a delicate texture and an undulated surface. Early in the spring they are covered with a light down, which gradually disappears, and at the approach of summer they are perfectly smooth, of a light green color above and whitish beneath. As the contrast of color between the surfaces is remarkable, and is peculiar to this species, Dr. Muhlenberg has denominated it *Fraxinus discolor*.

The seeds are one and eight-tenth inches long, cylindrical near the base, and gradually flattened into a wing, the extremity of which is slightly notched. They are united in bunches four or five inches long, and are ripe in the beginning of autumn. The shoots of the two preceding years are of a bluish-gray color and perfectly smooth: the distance between their buds sufficiently proves the vigor of their growth.

In large trees, the perfect wood is reddish and the sap is white. This wood is highly esteemed for its strength, suppleness, and elasticity, and is employed with advantage for a great variety of uses, of which I shall mention only the most common. It is always selected by coach-makers for shafts, for the felines of wheels, and at New York and Philadelphia for the frame of

carriage-bodies; by wheelwrights it is used for sledges and for the handles of wheelbarrows; in the district of Maine, it replaces the White Oak for the circular back of windsor chairs; scythe and rake handles, the hoops of water-pails, the circular piece of butter-boxes, sieves, and large spinning-wheels, which are manufactured principally at Hingham, or near Boston, are of White Ash; and in Connecticut it is usually preferred for wooden bowls. In the district of Maine it is extensively used for staves, which are of a quality between those of White and those of Red Oak, and are esteemed the best for containing salted provisions. It is admitted also into the lower frame of vessels, but is considered inferior to the Yellow Birch and to the heart of the Red Beech. In all the Atlantic States the blocks used in ships and the pins for attaching the cordage are of Ash, for which purpose the White Ash is employed in the Northern and the Red Ash in the Southern ports. On account of its strength and elasticity, the White Ash is esteemed superior to every other wood for oars, and second only to the Hickory for handspikes. In these forms it is exported to England and to the West Indies. It is also sent to England in planks, and is acknowledged by Oddy, in his Treatise on European Commerce, to be superior in many respects to the Common Ash.

The White Ash has long been known in France, England, and Germany, where it is propagated with success from the seed and by grafting; I have even remarked that in moist grounds its vegetation is more rapid than that of any indigenous species; its leaves are, at the same time, less liable to injury from the Spanish fly. Besides the beauty of its foliage, in which it surpasses the Common European Ash, it may be recommended for the excellence of its wood as a valuable acquisition to the North of Europe.

PLATE CXVIII.

A branch with leaves of half the natural size. Fig. 1. Seeds of the natural size.

See Nuttall's Supplement, vol. ii. p. 129.]

[The leaves and branches of the White Ash are said to be poisonous to serpents, and the leaf to cure their bite. No rattlesnakes are found in White-Ash swamps. An Ash leaf rubbed upon the swellings caused by mosquitos removes the itching and soreness immediately. The same effect is produced on the poison occasioned by the sting of the bee. According to Emerson, it is found in every part of Massachusetts. It thrives best near streams of water, but sometimes is seen nestling among rocks, where it attains a height of one hundred feet and more: one has been observed with a shaft of seventy feet without a limb; it was four and a half feet in diameter.

The Ash has been called the painters' tree, being, while young, remarkable for its gracefulness, and the softness and mellow green of its foliage producing a fine effect in contrast with the darker woods.]



Bacca del.

Gabriel sculp.

Red Ash.
Fraxinus lomentosa.

RED ASH.

FRAXINUS TOMENTOSA. *F. foliis subnoventis, dentatis, petiolatis; ramulis petiolisque pubescenti-tomentosis.*

Fraxinus pubescens. LINN.

OF all the Ashes, this species is the most multiplied in Pennsylvania, Maryland, and Virginia. It is commonly called Red Ash, and frequently Ash. Like the White Ash, it prefers swamps and places frequently inundated or liable to be covered with water by copious rains, and in these situations it is accompanied by the Shellbark Hickory, Bitternut Hickory, Swamp White Oak, Red Maple, Sweet Gum, and Tupelo.

The Red Ash is a beautiful tree, rising perpendicularly to the height of sixty feet with a diameter of fifteen or eighteen inches. It is inferior to the White Ash not only in size, but in the rapidity of its growth: the length of the annual shoots and the distance of the buds are but half as great as in the preceding species.

The leaves are from twelve to fifteen inches long, and are composed of three or four pair of very acuminate, denticulated leaflets, with an odd one. Their lower surface, as well as the shoots of the same season to which they are attached, is covered with a thick down: on insulated trees, this down is red at the approach of autumn, whence, probably, is derived the name of Red Ash. The seeds are shorter than those of the White Ash, but similar in form and arrangement.

The bark upon the trunk is of a deep brown, and the perfect wood is of a brighter red than that of the White Ash. The wood of this species possesses all the properties for which the other is esteemed, and in the ports of the Middle and Northern

States they are indifferently applied to the same diversified uses; that of the Red Ash, however, is somewhat harder, and consequently less elastic. Notwithstanding its inferiority of size, the Red Ash is perhaps more valuable for the regions to which it has been assigned by nature; of this the Americans will be able to judge by experience: both species are of such general utility that the utmost pains should be bestowed upon their preservation and increase.

PLATE CXIX.

A branch with leaves of half the natural size. Fig. 1. Seeds of the natural size.

[The specimen at Bartram's is fifty feet in height and five feet two inches in circumference. It thrives best in a moist situation.—MEEHAN.]

GREEN ASH.

FRAXINUS VIRIDIS.* *F. foliis septenis, dentatis, petiolatis, viridibus; ramulis petiolisque glabris.*

Fraxinus juglandifolia. LINN.

THE Green Ash is more common in the western districts of Pennsylvania, Maryland, and Virginia, than in any other part of the United States; but even here it is less multiplied than the White Ash and the Black Ash. Dr. Muhlenberg has par-

* [FRAXINUS JUGLANDIFOLIA. Lam. The Walnut-leaved Ash.]



H. J. Roseau del.

C. A. B. sculp.

Green Ash
Fraxinus viridis

ticularly observed it on the islands of the Susquehanna near Columbia, and I have found it most abundant on the banks of the Monongahela and the Ohio, between Brownsville and Wheeling. Probably this species is of moderate dimensions; for I have seen it laden with seeds while only twenty-five or thirty-five feet high and four or five inches in diameter.

The Green Ash is easily recognised by the brilliant color of its young shoots and of its leaves, of which the two surfaces are nearly alike. From this uniformity, which is rarely observed in the foliage of trees, Dr. Muhlenberg has given the species the name of *Fraxinus concolor*, and for the same reason, as it has received no popular specific name, I have called it Green Ash.

The leaves vary in length from six to fifteen inches, according to the vigor of the tree and to the coolness of the soil, and are composed of three, four, or five pair of petiolated, oval-acuminate and distinctly-denticulated leaflets surmounted by an odd one. The seeds are only half as large as those of the White Ash, but are similar in form. The wood of the Green Ash is distinguished by the same properties with that of the preceding species; but, as the others are common in the same regions, and are so much superior in size, it is only accidentally employed.

This species has been multiplied in France from seeds sent home by my father in 1785. It supports the inclemency of our winter, and is esteemed by amateurs for the singular tint of its foliage, which is strikingly contrasted with that of the surrounding trees.

PLATE CXX.

A branch with leaves of half the natural size. Fig. 1. Seeds of the natural size.

COMMON EUROPEAN ASH.

FRAXINUS EXCELSIOR. *F. foliis subsessilibus, lanceolato-oblongis, attenuatis, serratis; floribus nudis; seminibus apice emarginatis.*

THE Ash is the most common and the most useful species of its genus upon the Old Continent. Like the Common Oak and the White Oak, it is found throughout Europe and the North of Asia, and, as it is less sensible to cold, would probably be more multiplied than the Oaks, were it not restricted to certain soils. It is found almost exclusively on the borders of rivers and swamps, and in places constantly cool and shaded, without being exposed to inundation; in a word, in situations analogous to those which, in the United States, produce the White Ash and the Red Ash.

The Common Ash is ranked among trees of the first order. It is sometimes ninety feet high and nine or ten feet in circumference; but when sixty or seventy feet in height, it is in perfection for all the uses to which it is applied. The trunk is straight and well-proportioned; the branches are opposite, covered, while young, with a smooth, greenish bark, and garnished with short, round buds, nearly black, like those of the Black Ash. The leaves, which consist of four or five pair of leaflets with an odd one, are opposite like the branches, of a dark green color, smooth, acuminate, and slightly toothed. The flowers are not conspicuous, and are united in bunches; barren, fertile, and hermaphrodite flowers are found upon the same tree. The seeds are of a lanceolate-oval shape, and terminated by a flat wing, which is usually notched at the end: they are ripe toward the beginning of autumn.

In the properties and uses of its wood, the European Ash

*Frax. exc.**Frax. exc.*

Common European Ash
Fraxinus excelsior.

resembles the White Ash of America. In France, handsome articles of furniture are made with the pieces immediately below the first ramification, and with the knobs from the trunk of old trees, which exhibit more varied and more agreeable accidents in the direction of the fibres. The Common Ash is subject to be worm-eaten, and is rarely employed in building houses. It burns better than any other wood before it is seasoned, and affords excellent coal.

In the department of the Cantal, and in some other parts of France, the branches of the Ash are given both dry and green to sheep and cows, without imparting a disagreeable taste to the milk and butter.

Spanish flies are very fond of the leaves of this tree, upon which they sometimes swarm in such numbers as to diffuse an offensive odor.

The ancients, as we are informed by Pliny, believed that serpents had an antipathy to the Ash, and that they never approached it: this prejudice, which is still entertained, has given rise to the belief that a decoction of its roots or leaves in milk is an antidote for the poison of reptiles.

The general utility of its wood causes great attention to be bestowed, in every part of Europe, upon the propagation of the Ash. For this purpose, nurseries are formed from the seed, and the young plants, at the age of two or three years, are set out wherever the soil is cool and moist enough for their reception: they succeed well on uplands which are not too dry and sandy, or composed of too great a proportion of clay.

There are several varieties of the European Ash, the most remarkable of which is the Drooping Ash; its branches decline toward the earth, and the effect is peculiarly picturesque in solitary trees which have been formed by grafting this variety upon the Common Ash.

Many medicinal properties have been ascribed to the Ash, and more accurate observations lead me to believe that if these

virtues exist they can reside only in the inner bark, which is bitter and astringent.

The White Ash and the Blue Ash of the United States are superior to the Common European Ash in the very properties for which this species is most esteemed; there is no motive, therefore, for introducing it into the American woods: that it would flourish there is evinced by a beautiful example in the garden of Mr. W. Bartram, in the vicinity of Philadelphia.

PLATE CXXI.

A leaf of half the natural size. Fig. 1. Seeds of the natural size.

[There are many varieties of this tree, among which the *Pendula* should be planted and trained as an ornamental arbor.

There is a very interesting specimen at Bartram's, forming the "Washington Arbor," under which the Father of his country, Benjamin Franklin, Wilson, and other eminent men, have often sat; and wherein, surrounded by scenes he loved, William Bartram breathed his last. Here sat Washington when he replied to the French ambassador's playful inquiry what kind of a *nut* that (bombshell) was:—"It is a nut too hard for John Bull to crack."—MEEHAN.]



Frax. Ad.

Black Ash.
Fraxinus sambucifolia ?

Gabriel v. v.

BLACK ASH.

FRAXINUS SAMBUCIFOLIA. *F. foliolis sessilibus, acuminatis, serratis; ramis punctatis.*

IN the extensive country comprising the northern section of the United States, and the provinces of New Brunswick and Nova Scotia, the White Ash and the Black Ash, sometimes called Water Ash, are the most abundant in the forests, and the most accurately known by the inhabitants.

The Black Ash is sixty or seventy feet in height and about two feet in diameter. It requires a moister soil exposed to longer inundations than the White Ash, and is usually accompanied by the Red-flowering Maple, the Yellow Birch, the Black Spruce, and the Arbor-Vitæ; in the Middle States it prefers the company of the Red-flowering Maple and Red Ash.

The buds of the Black Ash are of a deep blue, and the young shoots of a bright green sprinkled with dots of the same color, which disappear as the season advances. The leaves at their unfolding are accompanied by stipulæ, which fall after two or three weeks: they are twelve or fifteen inches long when fully developed, and composed of three or four pair of leaflets with an odd one. The leaflets are sessile, oval-acuminate, denticulated, of a deep green color, smooth on the upper surface, and coated with red down upon the main ribs beneath: when bruised, they emit an odor like that of Elder leaves. The seeds, which are disposed in bunches four or five inches long, are flat, and, like those of the Blue Ash, are nearly as broad at the base as at the summit.

The Black Ash is easily distinguished from the White Ash by its bark, which is of a duller hue, less deeply furrowed, and has the layers of the epidermis applied in broad sheets. The

perfect wood is of a brown complexion and fine texture; it is tougher and more elastic than that of the White Ash, but less durable when exposed to the vicissitudes of dryness and moisture, and for this reason it is less extensively used. Coach-makers do not employ it, and it is never wrought into oars, handspikes, and pulleys. In the district of Maine, it is preferred to the White Ash for hoops, which are made of saplings from six to ten feet in length, split in the middle. As this wood may be separated into thin, narrow strips, it is selected in the country for chair-bottoms and riddles.

The Black Ash is more liable than any other species to be disfigured with knobs, which are sometimes of considerable size and are detached from the body of the tree to make bowls. The wood of these excrescences has the advantage of superior solidity, and, when carefully polished, exhibits singular undulations of the fibre; divided into thin layers, it might be employed to embellish mahogany.

In Vermont and New Hampshire, which furnish great quantities of potash, I have been informed that the ashes of this tree are singularly rich in alkali.

Such are the principal uses of the Black Ash, from which a general idea may be formed of its properties. It deserves a place in the forests of the North of Europe, and by employing its wood we shall learn to estimate its value with greater precision.

Observation. Another lofty species of Ash exists in Kentucky, which is also called Black Ash; but I am too imperfectly acquainted with it to attempt a description.

PLATE CXXII.

A branch with leaves of half the natural size. Fig. 1. Seeds of the natural size.



Rosa del

Gardner & Co.

Blue Ash.

Fraxinus quadrangulata.

[The Black Ash is not considered an ornamental tree, and is avoided in plantations. For baskets it is much employed. When it is to be divided, it is beaten with mallets until the fibres are somewhat loosened, when it may be divided into uniform ribbons of any required dimensions.]

BLUE ASH.

FRAXINUS QUADRANGULATA. *F. ramulis quadrangulatis, foliolis ad summum 4-jugis, sessilibus, ovali-lanceolatis, argute serratis, subtus pubescentibus, capsulis utrinque obtusis.*

THE Blue Ash is unknown in the Atlantic parts of the United States, and is found only in Tennessee, Kentucky, and the southern part of Ohio. The climate of these countries is mild, and the soil in some places so fertile that it is difficult, without having witnessed them, to form an idea of the luxuriance of vegetation and the productiveness of agriculture. The richness of the soil proves a substitute for that degree of moisture which, in the Atlantic States, seems indispensable to the Ash. In Kentucky and West Tennessee, the forests upon dry and uneven lands, at a distance from the rivers, are composed of the Walnuts, the Red Maple, the Moose Wood, the Hack Berry, the American Nettle, and the Oaks; several species of which, east of the mountains, grow only in the most humid soils.

The Blue Ash frequently exceeds sixty or seventy feet in height and eighteen or twenty inches in diameter. Its leaves are from twelve to eighteen inches long, and are composed of two, three, or four pair of leaflets with an odd one. The leaflets are large, smooth, oval-acuminate, distinctly toothed, and supported by short petioles. The young shoots to which the

leaves are attached are distinguished by four opposite membranes, three or four lines broad and of a greenish color, extending through their whole length: this character disappears the third or fourth year, leaving only the traces of its existence. The seeds are flat from one extremity to the other and a little narrowed toward the base.

The wood of the Blue Ash possesses the characteristic properties of the genus; and, of all the species of the Western States, it is the most extensively employed and the most highly esteemed. Besides the habitual use that is made of it for the frames of carriages and for the felloes of wheels, it is generally selected for the flooring of houses, frequently for the exterior covering, and sometimes for the shingles of the roof; but for the last purpose the Tulip Tree is preferred. I have been told that a blue color is extracted from the inner bark of this tree; but I have never seen it employed, and do not know by what process it is obtained. Milk in which the leaves have been boiled is said to be an unfailing remedy for the bite of the rattlesnake: we may be allowed, however, to doubt its efficacy till it is attested by enlightened physicians.

My father first described the Blue Ash in his *Flora Boreali Americana*, and from the seeds which he sent home have sprung the beautiful stocks that are now growing in Europe; but they are still too young to yield fruit, and they are propagated by grafting upon the Common Ash.

The various uses to which the wood of the Blue Ash is appropriated in America should induce the Europeans to multiply it in their forests, till they are enabled to appreciate its comparative value.

PLATE CXXIII.

A branch with leaves of half the natural size. Fig. 1. Seeds of the natural size.



H. J. Andrews del.

G. B. S. sculp.

Carolinian Ash.
Fraxinus platycarpa.

CAROLINIAN ASH.

FRAXINUS PLATICARPA. *F. foliolis petiolatis, ovalibus, serratis; capsulis lato lanceolatis.*

THIS species of Ash, which is very distinctly characterized by the form of its leaves and seeds, is confined to the Southern States. It abounds particularly on the river Cape Fear, in North Carolina, and upon the Ashley and the Cooper, in South Carolina. As it has received no specific name from the inhabitants, I have given it that of Carolinian Ash.

The marshy borders of creeks and rivers, and all places exposed to long inundations, are congenial to this Ash, which delights in more abundant moisture than the other species. Its vegetation is beautiful, but its stature rarely exceeds thirty feet, and it fructifies at half this height. In the spring the lower side of the leaves and young shoots is covered with thick down, which disappears at the approach of summer. The leaves commonly consist of two pair of leaflets with a terminal odd one. The leaflets are large, nearly round, petiolated, and distinctly toothed. The flowers, as in the other species, are small and not very conspicuous; the seeds, unlike those of any Ash with which we are acquainted, are flat, oval, and broader than they are long.

From its inferior dimensions, the Carolinian Ash is totally neglected; but accurate experiments on the nature of different species of wood in America will perhaps evince that this tree, as well as others that are regarded as worthless, possesses properties of eminent utility.

PLATE CXXIV.

A branch of half the natural size. Fig. 1. Seeds of the natural size.

BLACK WILLOW.

SALIX NIGRA. *S. foliis lanceolatis, acuminatis, serratis, glabris; petiolis pubescentibus.*

Amentaceæ. JUSS.

THIS species is the most common of the American Willows, and the most analogous to that of Europe. It is less multiplied in the Northern and Southern than in the Middle and especially in the Western States. It is found on the banks of the great rivers, such as the Susquehanna and the Ohio, and is called Black Willow, or simply Willow.

The Black Willow is rarely more than thirty or thirty-five feet high and twelve or fifteen inches in diameter. It divides at a small height into several divergent but not pendent limbs, and forms a spacious summit. The leaves are long, narrow, finely denticulated, of a light green, and destitute of stipulæ. In the uniformity of its coloring, the foliage of this species differs from that of the European Willow, the lower surface of which is glaucous.

Upon the trunk the bark is grayish and finely chapped; upon the roots it is of a dark brown, whence may have been derived the specific name of the tree. The roots afford an intensely-bitter decoction, which is considered in the country as a purifier of the blood, and as a preventive and remedy for intermittent fevers.

The wood is white and soft, and the branches are easily broken from the tree. Neither the wood nor the twigs are applied to any useful purpose.

PLATE CXXV.

Fig. 1. Leaves of the natural size.



A. Rodenre del.

J. B. Smith sculp.

1. Black Willow.
Salix nigra.

2. Champlain Willow.
Salix ligustrina.

3. Shining Willow.
Salix lucida.

[See Nuttall's Supplement, vol. i., for a great number of Willows found in the countries bordering on our Pacific coast. See also Emerson's "Trees and Shrubs of Massachusetts."

The Black Willow is known to basket-makers as the "Wicker Willow."

The subject of Willow-planting, for the uses of the basket-maker, has been much referred to of late. For the best mode of cultivating it for profit, see "Transactions of the Norfolk (Massachusetts) Agricultural Society, 1852," and the several volumes of the "Horticulturist."]

CHAMPLAIN WILLOW.

SALIX LIGUSTRINA. S. foliis lanceolato-linearibus, acuminatis, serratis; stipulis inæqualiter cordatis; petiolis villosis.

I HAVE found this Willow on the shores of Lake Champlain, particularly near the village of Skeensborough. It is about twenty-five feet high and seven or eight inches in diameter: its first aspect resembles that of the Black Willow, but its leaves are longer, narrower, and accompanied at the base by cordiform, serrate stipulæ. Its wood and branches are appropriated to no use.

PLATE CXXV.

Fig. 2. Leaves of the natural size.

SHINING WILLOW.

SALIX LUCIDA. *S. foliis oblongis, cuspidato-acuminatis, nitidis; argute serratis; serraturis glandulosis.*

I HAVE observed the Shining Willow—which is so called by some persons on account of the brilliancy of its foliage—only in the Northern and Middle States. It is found in moist but open grounds, and is more common on the edges of the salt meadows than in the interior of the forests; it is also seen on the islands not covered with woods, in the rivers and near the shores of the lakes.

This species is easily distinguished by the superior size of its leaves, which are oval-acuminate, denticulated, and sometimes four inches in length.

The Shining Willow attains the height of eighteen or twenty feet; but its ordinary elevation is nine or ten feet. Baskets are made of its branches when those of the European Willow, which are preferable, cannot be obtained; but it possesses no property that recommends it to attention.

Observation. Many species of Willow are found in the United States and in Canada, the greater part of which are susceptible of no useful application. The three species which I have described are distinguished only by their superior height; but even these are greatly inferior to the European Willow in size and in the properties of their wood. In the Northern and Middle States, particularly in Pennsylvania and in some townships in the lower part of New Jersey, great numbers of the European Willow have been planted, of which light baskets are fabricated for the market of Philadelphia. This tree furnishes the charcoal for the manufacture of gunpowder.

PLATE CXXV.

Fig. 3. A leaf of the natural size.



Bacca del

Gabriel 16

White Elm.
Ulmus Americana

WHITE ELM.

ULMUS AMERICANA. *U. ramis laxis, pendulis; foliis subuniformiter serratis; floribus manifestè pedicellatis; fructibus densissimo fimbriatis.*

Pentandria digynia. LINN. Amentaceæ. JUSS.

THIS tree, which is known throughout the United States by the name of White Elm, is found over an extensive tract of the North American Continent. Toward the north, my father indicates its first appearance in the latitude of about 48° 20', eighteen miles from the mouth of the river Mistassin, which empties into Lake St. John, in Canada. I have myself observed it from Nova Scotia to the extremity of Georgia,—a distance of twelve hundred miles. It abounds in all the Western States; and I have learned that it is common in the neighborhood of the great rivers that water Upper Louisiana and empty into the Mississippi. But it appeared to be the most multiplied and of the loftiest height between the 42d and 46th degrees of latitude, which comprise the provinces of Lower Canada, New Brunswick, and Nova Scotia, the northeastern section of the United States, and Genesee, in the State of New York.

The leaves of the White Elm are four or five inches long, borne by short petioles, alternate, unequal at the base, oval-acuminate, and doubly denticulated. They are generally smaller than those of the Red Elm, of a thinner texture and a smoother surface, with more regular and prominent ribs.

This species differs also essentially from the Red Elm and the European Elm in its flowers and seeds; the flowers appear before the leaves, and are very small, of a purple color, supported by short, slender footstalks, and united in bunches at the extremity of the branches. The seeds are contained in a flat,

oval, fringed capsule, notched at the base: the season of their maturity is from the 15th of May to the 1st of June.

The White Elm delights in low, humid, substantial soils, such as in the Northern States are called *interval lands*. In the Middle States it grows in similar situations, and on the borders of swamps, where it is usually accompanied by the White Oak, the Sweet Gum, the Tupelo, the Red Maple, and the Shagbark Hickory. West of the mountains, it abounds in all the fertile bottoms watered by the great rivers that feed the Ohio and the Mississippi. I have constantly observed it on their banks with the White Maple and the Buttonwood, where its base is inundated at the rising of the waters in the spring. On the margins of these rivers it is sometimes four feet in diameter. In the Middle States it stretches to a great height, but does not approach the magnificence of vegetation which it displays in the countries peculiarly adapted to its growth. In clearing the primitive forests a few stocks are sometimes left standing; insulated in this manner, it appears in all its majesty, towering to the height of eighty or one hundred feet, with a trunk four or five feet in diameter, regularly shaped, naked, and insensibly diminishing to the height of sixty or seventy feet, where it divides into two or three primary limbs. The limbs, not widely divergent near the base, approach and cross each other eight or ten feet higher, and diffuse on all sides long, flexible, pendulous branches, bending into regular arches and floating lightly in the air. A singularity is observed in this tree which I have witnessed in no other; two small limbs four or five feet long grow in a reversed position near the first ramification, and descend along the trunk.

The Buttonwood astonishes the eye by the size of its trunk and the amplitude of its head; but the White Elm has a more majestic appearance, which is owing to its great elevation, to the disposition of its principal limbs, and the extreme elegance of its summit. In New Hampshire, between Portsmouth and

Portland, a great number of young White Elms are seen detached in the middle of the pastures; they ramify at the height of eight, ten, or twelve feet, and their limbs, springing at the same point, cross each other and rise with a uniform inclination, so as to form of the summit a sheaf of regular proportions and admirable beauty.

The trunk of this Elm is covered with a white, tender bark, very deeply furrowed. The wood, like that of the Common European Elm, is of a dark brown, and, cut transversely or obliquely to the longitudinal fibres, it exhibits the same numerous and fine undulations; but it splits more easily, and has less compactness, hardness, and strength. This opinion was given me by several English wheelwrights established in the United States; and I have since proved its correctness by a comparison of the two species. The White Elm is used, however, at New York and farther north for the naves of coach-wheels, because it is difficult to procure the Black Gum, which at Philadelphia is preferred for this purpose. It is not admitted into the construction of houses or of vessels, except occasionally, in the district of Maine, for keels, for which it is adapted only by its size. Its bark is said to be very easily detached during eight months of the year; soaked in water and suppld by pounding, it is used in the Northern States for the bottom of common chairs.

Such are the few and unimportant uses of the White Elm in the United States; it is far inferior to the European Elm, which is a tree of very extensive utility, and it deserves attention in the Old World only as the most magnificent vegetable of the temperate zone.

PLATE CXXVI.

A branch with leaves of the natural size. Fig. 1. Flowers. Fig. 2. Seeds.

[See Nuttall's Supplement, vol. i. p. 51.]

[*Soil, Propagation, &c.* The suckers produced by the Common Elm, both near and at a distance from the stem, afford a ready mode of propagation adopted throughout Europe; the suckers are procured from the roots of grown-up trees, in hedge-rows or plantations. Layers from stools, and grafting on the *U. montana*, may also be employed; the layers are made in autumn or the winter, and are rooted, or fit to be taken off, in a year. The seeds fall from the tree in May as soon as they are ripe, and, being swept up, are sown immediately in beds of rich, light soil, the seeds being placed about one inch apart every way, and covered to the depth of an eighth of an inch. The plants come up the same season, and are fit for transplanting into nursery-lines in the autumn.

The Elm is not a brittle tree, and not liable to be injured by high winds. It is, however, subject to many diseases, and attacked by many kinds of insects. As a noble ornamental tree, its value is widely appreciated, and its importance in this respect does not require to be enforced. In New England, particularly, fine avenues are to be met with. In France, the Elm is subjected to being trimmed in artificial forms, flat surfaces, and for hedges; it is very patient of the knife: at the town of Versailles, near Paris, and at other places on the continent, the traveller is struck with the formal avenues of Elm Trees of very considerable size which have been subjected to an annual shearing; they then present a flat surface on each side of the street.

The White Elm in many districts is particularly subject to be preyed upon by insects, and has therefore been abandoned by many.]



Bacca del

Wahoo

Wahoo.
Ulmus alata.

WAHOO.

ULMUS ALATA. *U. ramis passim ex utroque latere in alam suberosam corticalem dilatatis; foliis oblongo-ovalibus, sensim acutis, basi subsequalibus; fructu pubescente et confertius cilioso.*

Ulmus pumila. WALTER.

THE Wahoo is a stranger to the Northern and Middle States, and to the mountainous regions of the Alleghanies; it is found only in the lower part of Virginia, in the maritime districts of the Carolinas and Georgia, in West Tennessee, and in some parts of Kentucky. Probably it grows also in the two Floridas and in Lower Louisiana, of which the soil and climate are analogous to those of the maritime parts of the Southern States, and of which the vegetable productions, with some exceptions, are the same.

The name of Wahoo, given to this species of Elm in South Carolina and Georgia, is derived from the Indians; but I am ignorant of its meaning.

The Wahoo grows of preference on the banks of rivers and in the great swamps enclosed in the pine-barrens: it has always appeared to me to be less multiplied than the trees by which it is accompanied. It is of a middling stature, commonly not exceeding thirty feet, with a diameter of nine or ten inches: the two largest stocks that I have seen were at Wilmington, N.C.; they were, perhaps, forty or forty-five feet high, fifteen inches in diameter, and seemingly very old.

The flowers, like those of other Elms, open before the leaves. The seeds are fringed, and differ from those of the White Elm only by a little inferiority of size. The leaves are borne by short petioles, and are oval, denticulated, and smaller than those of the White and Red Elms.

The branches are furnished throughout their whole length, on two opposite sides, with a fungous appendage two or three lines wide, from which the name of *alata*, "winged," has been given to the species.

The wood of the Wahoo is fine-grained, more compact, heavier, and, I believe, stronger, than that of the White Elm. The heart is of a dull red approaching to chocolate color, and always bears a large proportion to the sap. At Charleston, S.C., and in some other towns of the Southern States, it is employed for the naves of coach-wheels, and is even preferred, for this object, to the Tupelo, as being harder and tougher; but it is appropriated to no other use.

For economical purposes, this species is uninteresting to the Europeans, as the Common Elm is greatly superior in size and in the quality of its wood: these advantages should engage the Americans to introduce the European species into their forests.

PLATE CXXVII.

A branch with leaves of the natural size. Fig. 1. Seeds of the natural size.



Bessa del.

Gabriel sculp.

Red Elm.
Ulmus Rubra

RED ELM.

ULMUS RUBRA. *U. foliis plerumque ovalibus oblongis, rarius cordato-ovalibus, utrinque rugosis; gemmis sub explicatione densâ fulvâque lanâ tomentosis; floribus sessilibus.*

EXCEPT the maritime districts of the Carolinas and Georgia, this species of Elm is found in all parts of the United States and of Canada. It bears the names of Red Elm, Slippery Elm, and Moose Elm, of which the first is the most common: the French of Canada and Upper Louisiana call it *Orme gras*.

The Red Elm, though not rare, is less common than the Oaks, the Maples, the Sweet Gum, and the Sassafras; it is also less multiplied than the White Elm, and the two species are rarely found together, as the Red Elm requires a substantial soil free from moisture, and even delights in elevated and open situations, such as the steep banks of rivers, particularly of the Hudson and the Susquehanna. In Ohio, Kentucky, and Tennessee, it is more multiplied than east of the mountains, and with the Hickories, the Wild Cherry Tree, the Red Mulberry, the Sweet Locust, the Coffee Tree, and some other species, constitute the growth upon the richest lands of an uneven surface.

This tree is fifty or sixty feet high and fifteen or twenty inches in diameter. In the winter it is distinguished from the White Elm by its buds, which are larger and rounder, and which, a fortnight before their development, are covered with a russet down.

The flowers are aggregated at the extremity of the young shoots. The scales which surround the bunches of flowers are downy like the buds. The flowers and seeds differ from those of the preceding species: the calyx is downy and sessile, and

the stamina are short and of a pale rose color; the seeds are larger, destitute of fringe, round, and very similar to those of the European Elm; they are ripe toward the end of May. The leaves are oval-acuminate, doubly denticulated, and larger, thicker, and rougher than those of the White Elm.

The bark upon the trunk is brown; the heart is coarser-grained, and less compact than that of the White Elm, and of a dull-red tinge. I have remarked that the wood, even in branches of one or two inches in diameter, consists principally of perfect wood. This species is stronger, more durable when exposed to the weather, and of a better quality, than the White Elm; hence in the Western States it is employed with greater advantage in the construction of houses, and sometimes of vessels on the banks of the Ohio. It is the best wood of the United States for blocks, and its scarceness in the Atlantic States is the only cause of its limited consumption in the ports. It makes excellent rails, which are of long duration and are formed with little labor, as the trunk splits easily and regularly; this is probably the reason that it is never employed for the naves of wheels.

The Red Elm bears a strong likeness to a species or a variety in Europe known by the name of Dutch Elm. The leaves and the bark of the branches, macerated in water, yield, like those of the Dutch Elm, a thick and abundant mucilage, which is used for a refreshing drink in colds, and for emollient plasters in place of the marsh-mallow root, which does not grow in the United States.

Though the Red Elm is superior to the White Elm, it is not equal to our European species, and its culture cannot be generally recommended.

Observations. In the district of Maine and on the banks of Lake Champlain I have found another Elm which I judged to be a distinct species. Its leaves were oval-acuminate, rough, and



1. Common European Elm.
Ulmus campestris.

2. Dutch Elm.
Ulmus laevis.

deeply toothed; but I have not seen its flowers or its seeds. The length of its young shoots announced a vigorous vegetation. It is confounded in use with the White Elm, to which it is perhaps superior; it is found in the nurseries of France, and probably it came originally from Canada.

PLATE CXXVIII.

A branch with leaves and seeds of the natural size.

COMMON EUROPEAN ELM.

ULMUS CAMPESTRIS. *U. foliis duplicato-serratis, basi inæqualibus; floribus subsessilibus, conglomeratis, pentandris; fructibus glabris.*

UPON the Old Continent one of the most useful trees in the mechanical arts is the Elm, which is indigenous to the centre of Europe and to the North of Asia. It was formerly most abundant in Germany; and the town of Ulm, in Suabia, is said to derive its name from the vast forests of Elm that existed in its vicinity.

This tree was cultivated by the ancients, and highly esteemed for the excellence of its wood: it is frequently mentioned by Virgil, Pliny, and Theophrastus.

No forests consisting wholly of Elm are found in England, Germany, France, or Italy; but the habitual use and superior fitness of its wood for certain valuable purposes cause it to be propagated on private estates, by the sides of highways, and in the large forests which in different countries are protected by Government. Thus cultivated and artificially multiplied, it has produced numerous varieties, like the fruit trees, which are dis-

tinguished principally by their foliage: in some of them the leaves are small, shining, and coriaceous; in others, large, downy, and supple. To this difference must be added that of the bark: upon a trunk six inches in diameter, in some varieties, the bark is smooth; in others it is rough and scaly upon saplings less than two inches thick. Distinctions are also founded upon the rapidity of vegetation and the quality of the wood. Nurserymen assure us that new varieties are constantly appearing among the young plants reared from the seed; hence it becomes impossible to compose invariable definitions, or to harmonize the confusion of botanical writers.

But all these varieties may be referred to two types, in which remarkable differences are found and constantly reproduced. One of these is the Common Elm, under which are ranged all the ordinary varieties; the other is the Large-leaved or Dutch Elm.

The Common Elm is one of the tallest and finest trees of the temperate zone of Europe; several stocks yet survive in France which were planted in the reign of Henry IV., about the year 1580, by the orders of Sully, and which are twenty-five or thirty feet in circumference and eighty or ninety feet high.

The leaves of the Common Elm are oblong, pointed, doubly serrate, and unequal at the base. The flowers appear in the beginning of March, about three weeks before the leaves: they are small, reddish, not conspicuous, and are united in clusters on the shoots of the preceding year; they are succeeded by oval, bordered capsules, containing a single flat, roundish seed, which varies in size in different varieties, and is ripe toward the end of April.

The wood of the Elm has less strength than the Oak and less elasticity than the Ash, but it is tougher and less liable to split. In France, it is usually employed for mounting artillery, and for this purpose is selected with the greatest care. The trees are cut according to the use to which they are destined,

and the pieces are stored under shelter to dry during six or seven years; the precaution is even observed of turning them every six months, that the seasoning may proceed more uniformly. Thus perfected, the wood is used for the carriages of cannon, and for the gunwale, the blocks, &c. of ships. It is everywhere preferred by wheelwrights for the naves and felloes of wheels, and for other objects.

The quality of this wood depends in a singular degree on the situation in which it grows: high ground and a strong soil are necessary to its perfection; and when planted in such a soil on the side of roads, or on the ramparts of fortified towns, where it is vexed by the winds and exposed to all the influences of the seasons, it is firmer and more solid.

The knobs which grow upon old trunks are divided into thin plates by cabinet-makers, and when polished they exhibit very diversified accidents in the arrangements of the fibre, and form beautiful articles of furniture.

Well-cords are made of the bark of the Elm; the wood is an excellent combustible, and in some countries the leaves are given for food to sheep and larger cattle.

In fertile and humid soils the Elm is subject to a species of ulceration, which appears on the body of the tree at the height of three or four feet, and which discharges a great quantity of sap. The disease penetrates gradually into the interior of the tree and corrupts its substance. Many attempts have been made to cure it in the beginning or to arrest its progress, but hitherto without success: the best treatment is to pierce the tree to the depth of two or three inches with an auger, in the very heart of the malady, which is declared by the flowing of the sap.*

The English writers on forest trees—Evelyn; Miller, Marshall,

* [Another mode of treatment recommended is to pierce the ulcer, and then dress the wound with powdered charcoal, or a mixture of cow-dung and clay.]

&c.—mention twenty varieties of the Elm, seven of which are particularly remarkable, and may serve as types of the rest; these are the True English Elm, the Narrow-leaved Cornish Elm, the Dutch Elm, the Black Worcestershire Elm, the Narrow-leaved Witch Elm, and the Upright Witch Elm. On the continent we possess these principal varieties, and those that are referred to them; but we consider the Dutch Elm as a distinct species, not derived, like the others, from the Common Elm.

In England, the true English Elm is recognised as the best wood; and to avoid mistake, in forming plantations, grafted stocks are procured from the nurseries; for neither the foliage nor the wood offers any peculiar appearance by which it may be certainly distinguished.

In the description of the Tupelo, particular mention has been made of a precious variety of the Common Elm, the *Twisted Elm*, omitted by the German and English writers, which is propagated in the departments about Paris, in that of the North, and in Belgium.

It is an object of importance to multiply this invaluable variety, which can be done only by grafting or by transplanting suckers. It is reared with the greatest care at Meaux and Mendes, a few leagues from Paris, and thence it is procured with the greatest certainty.

The Curled Maples, till they are seven or eight inches in diameter, exhibit no undulations of the fibre, and a similar fact is observed in the Twisted Elm; the fibres do not assume the spiral direction till the trunk is nine or ten inches thick. In comparing attentively young Twisted Elms less than eight inches in diameter with other varieties planted at the same time in the same soil, the only difference I observed was, that the vegetation of the Twisted Elm was more vigorous, its foliage of a lighter green, and its bark perfectly smooth, while that of the other stocks, even when only two inches in diameter, was thick and chapped.

In France, Belgium, and some parts of Germany, many of the highways, as well as the public walks in the neighborhood of large towns, are planted with the Elm, which, besides the value of its wood, has a tufted foliage, and suffers the pruning-hook without injury. The trees destined for this purpose are reared in nurseries, and when about two inches in diameter are set out in the autumn, at the distance of twenty-four feet. During the first years, the ground is kept loose, that the rain may penetrate more easily to their roots.

PLATE CXXIX.

Plate 1. Leaves of the natural size. Fig. 1. Flowers of the natural size.

Fig. 2. Seeds of the natural size.

DUTCH ELM.

ULMUS SUBEROSA. *U. foliis duplicato-serratis, rugosis; floribus subsessilibus, conglomeratis, tetrandris; fructibus glabris; cortice ramulorum suberoso-alato.*

THIS species is easily distinguished from the Common European Elm by its leaves, which are larger, thicker, rugged on both surfaces, and borne by short petioles. The flowers, also, are of a lighter tint, and the seeds are larger. In the winter, when stripped of its foliage, the Dutch Elm is recognised by its round buds, and by the thickness of its shoots of the preceding year.

The bark of the young branches, as in the Red Elm, is full of mucilage, which, thirty years ago, was celebrated in cutaneous affections. It was preserved and given in decoction, in doses of

two ounces, steeped in a quart of river-water, reduced by boiling to a pint. This practice was long prevalent; but, notwithstanding some authentic attestations of its success, it has fallen into disuse.

The Dutch Elm so nearly resembles the Red Elm of the United States in its flowers, foliage, and fruit, that it is not always easy to distinguish them: the most striking difference is in the buds; those of the Red Elm are covered in the spring with a thick, reddish down; those of the Dutch Elm, on the contrary, are smooth, or, at most, are lightly powdered on the edges of the scales. This European species attains a very lofty height and a considerable diameter. Its wood is softer than that of the Common Elm; but the writers on forest trees speak variously of its qualities, and I have consulted wheelwrights without obtaining satisfactory information; on the most favorable supposition, it is greatly inferior to the Twisted Elm.

PLATE CXXIX.

Plate 2. A branch with a leaf of the natural size. Fig. 1. A seed of the natural size.

PLANER TREE.

PLANERA ULMIFOLIA. P. foliis petiolatis, oblongo-ovalibus, sensim angustatis, acutis, basi obtusis, æqualiter serratis; capsulâ scabrá.

KENTUCKY, Tennessee, the banks of the Mississippi, and the Southern States, are the only parts of the American Republic where my father and myself have found the Planer Tree. Its wood is not used, and probably for this reason the tree has attracted no attention from the inhabitants, and has received



H. B. Redouté del.

Gabriel sculp.

Planer Tree.
Planera Ulmifolia



P.J. Redouté del.

G. Engelb. sculp.

Bass Wood
Tilia Americana.

no distinctive denomination; to supply the deficiency, I have adopted the botanical name.

I have more particularly observed the Planer Tree in the large swamps on the borders of the river Savannah, in Georgia. It is a tree of the second order, and is rarely more than thirty-five or forty feet high and twelve or fifteen inches in diameter. Its bloom is early and not conspicuous. Its minute seeds are contained in small, oval, inflated, uneven capsules. The leaves are about an inch and a half long, oval-acuminate, denticulated, of a lively green, and a little like those of the European Elm, to which this species bears the greatest analogy.

The wood of the Planer Tree is hard, strong, and seemingly proper for various uses; it is probably similar in its characters to the analogous species in the North of Asia, the *Siberian Elm*; but, as I have already remarked, the tree is rare and the wood neglected.

PLATE CXXX.

A branch with leaves and seeds. Fig. 1. A small shoot with male flowers.

AMERICAN LIME OR BASS WOOD.

TILIA AMERICANA. T. foliis suborbiculato-cordatis, abrupte acuminatis, argute serratis, glabris; petalis apice truncatis; nucce ovali.

Polyandria monogynia. LINN. Tiliaceæ. JUSS.

AMONG the Lime Trees of North America, east of the Mississippi, this species is the most multiplied. It exists in Canada, but is more common in the northern parts of the United States, where it is usually called Bass Wood: it becomes less frequent

toward the south; and in Virginia, the Carolinas, and Georgia, it is found only on the Alleghany Mountains.

I found this species of Lime Tree most abundant in Genesee, which borders on Lake Erie and Lake Ontario. In some districts, particularly between Batavia and New Amsterdam, it frequently constitutes two-thirds, and sometimes the whole, of the forests. The Sugar Maple, the White Elm, and the White Oak are the trees with which it most frequently associates.

In newly-cleared lands, the remains of the Lime Trees are distinguished by the numerous sprouts which cover the stumps and the large roots, whose growth can be prevented only by stripping off the bark or by the operation of fire. The stumps of other large trees, the Elm, the Sugar Maple, and the Ash, left at the same height of three feet, do not produce shoots.

The presence of the Lime Tree indicates a loose, deep, and fertile soil. It is sometimes more than eighty feet high and four feet in diameter; and its straight, uniform trunk, crowned with an ample and tufted summit, forms a beautiful tree. The leaves are alternate, large, nearly round, finely denticulated, heart-shaped at the base, and abruptly terminated in a point at the summit. The flowers are borne by long peduncles, pendulous, subdivided at the extremity, and garnished with a long, narrow, floral leaf. The seeds, which are ripe about the first of October, are round and of a gray color. The flowers of the American Lime Tree are probably endowed with the same antispasmodic and cephalic properties which are ascribed to those of the European species.

The trunk is covered with a very thick bark: the cellular tissue, separated from the epidermis and macerated in water, is formed into ropes, which are used only in the country; in Europe, they are sold for certain purposes in the cities, particularly for well-cords.

The wood is white and tender; in the Northern States, where the Tulip Tree does not grow, it is used for the panels of car-

riage-bodies and the seats of windsor chairs; but, as it is softer and splits more easily, it is less proper for these objects: in Boston and the more northern towns, I have observed the Lime Tree beginning to be substituted for the Tulip Tree. On the Ohio, the images affixed to the prow of vessels are made of this wood instead of the White Pine.

The American Lime Tree has long been cultivated in Europe, and it is distinguished from our native species by the superior size of its leaves.

PLATE CXXXI.

A branch with leaves diminished one-half, and with flowers of the natural size.

[*Soil, Propagation, &c.* This tree may be propagated by shoots or by seed. The seeds may be beaten down with a pole and received on a sheet, spread in a dry place for a few days, and planted in a rich garden-mould, covering them an inch deep. When the plants make their appearance in the spring, they should be constantly kept clean from weeds, and gently watered in dry weather; in two years removed to a nursery, shortening the roots and the young side-branches, digging between the rows every winter and removing them when of sufficient size. The French gardeners cut an old tree near the ground, which soon sends up numerous shoots. Among these a quantity of soil is thrown, and after two years the shoots are found well rooted and ready for removal. Layering is also practised.

The American Lime Tree grows vigorously in sandy and exposed situations, and, being little affected by the sea-breeze, might be advantageously employed among the sands of the sea-shore.

The wood of the European tree forms excellent charcoal: the bark separated by maceration into fibres is used for binding packages, and by gardeners for confining plants or bundles.

Where a great mass of foliage and a deep shade are required, the American Lime, which is not so liable to be infested with insects as the European, is recommended. It transplants readily, especially to a rich, rather moist, loam. It attains by age to a great size, and often presents a weeping character. Its flowers are great favorites with bees.]

WHITE LIME TREE.

TILIA ALBA. T. foliis majoribus, ovatis, argute serratis; basi oblique aut æqualiter truncatis; subtus incanis.

I HAVE not met with the White Lime Tree east of the river Delaware; but it is abundant in Pennsylvania, Maryland, Delaware, and the Western States. It does not grow, like the preceding species, in elevated places, nor amid other trees in the forests, and is rarely seen except on the banks of rivers; I have particularly observed it on those of the Susquehanna, the Ohio, and the streams which empty into them.

The height of the White Lime Tree rarely exceeds forty feet, and its diameter twelve or eighteen inches. Its young branches are covered with a smooth, silver-gray bark, by which it is recognised in the winter. The leaves are very large, denticulated, obliquely heart-shaped, and pointed, of a dark-green on the upper surface and white beneath, with small reddish tufts on the angles of the principal nerves. This whitish tint is most striking on solitary trees exposed to the sun.

The flowers come out in June, and, as well as the floral leaf, are larger than those of any other Lime Tree with which I am acquainted. The petals are larger and whiter, and are impreg-



White Lime.
Tilia Alba.



P. A. Redouté del.

Gabriel sculpt.

Downy lime tree.
Tilia pubescens.

nated with an agreeable odor. The seeds are round, or rather oval, and downy.

The wood of this tree is white and tender, and I believe it is never employed in the arts.

This and the following species have received no popular specific names, but are both called Lime Tree and Bass Wood; that of White Lime, which I have given to the subject of the present article on account of the color of its foliage, is peculiarly appropriate.

PLATE CXXXII.

A branch with leaves and flowers of the natural size. Fig. 1. Seeds.

DOWNY LIME TREE.

TILIA PUBESCENS. T. foliis basi truncatis, obliquis, denticulato-serratis, subtus pubescentibus; petalis emarginatis, nucce globosâ.

THE Downy Lime Tree belongs to the southern parts of the United States and to the Floridas. It grows of preference on the borders of rivers and large marshes, where the soil is cool and fertile, but not exposed to inundation. It is little multiplied, and consequently is not taken notice of by the inhabitants; for this reason, and because it is the only species of its kind in the maritime parts of the Carolinas and of Georgia, it has received no specific denomination, and is called simply Lime Tree, to which I have added the epithet *downy*, derived from a character of its foliage not observed in the preceding species.

This tree is forty or fifty feet in height, with a proportional diameter. In its general appearance it resembles the American

Lime Tree, which grows farther north, more than the White Lime Tree, which belongs to the Middle and Western States. Its leaves differ widely in size according to the exposure in which they have grown; in dry and open places they are only two inches in diameter, and are twice as large in cool and shaded situations. They are rounded, pointed at the summit, very obliquely truncated at the base, edged with fewer and more remote teeth than those of the other Lime Trees, and very downy beneath. The flowers, also, are more numerous, and form larger bunches, and the seeds are round and downy.

The wood is very similar to that of the other species, and I do not know that it is ever employed.

This tree was introduced long since into France; its vegetation is vigorous, and is uninjured by the severest winters of Paris, which leads me to believe that it exists in Upper Louisiana and in the Western States.

PLATE CXXXIII.

A branch with leaves and fruit of the natural size.

P I N E S.

THE Pines are evergreen trees, and are generally of elevated stature. They form a most interesting genus, and are highly valuable for the resinous matter which they afford, as well as for the excellent properties of their wood. The most striking difference between the Pine and the Spruce is in the arrangement of their foliage: the leaves of the Pines, which resemble pieces of coarse thread, vary in length in different species, and are united to the number of two, three, or five in the same sheath; those of the Spruces, on the contrary, are only a few lines long, and are attached singly round the circumference of the branch or upon its opposite sides.

To facilitate the distinction of these trees, of which the species are more numerous in the United States than in Europe, I have grouped the Pines according to the roughness of their cones and to the number of leaves united in the same sheath, and the Spruces according to the disposition of their foliage.

[See Nuttall's Supplement, vol. ii. p. 166; *et seq.*, for a variety of new and valuable Pines.]

[*Soil, Propagation, &c.* The debris of granitic rocks may be considered as the universal soil suited to the Pine and Fir tribe, and a dry subsoil an essential condition for their entire prosperity; but they will grow on all soils whatever that are not surcharged with water; the roots are near the surface, and hence do not require a deep one; and, as their needle-like leaves do not carry off much moisture by evaporation, their earths

may be drier than that required for any other kind of tree. Nevertheless, a soil somewhat loamy, and a cool subsoil, are necessary to bring the timber of the Pine to its greatest perfection. Wherever the *Abietinæ* are to be exposed to high winds, they require to be planted in masses, so as to shelter one another; but none of the species become ornamental when so planted, because they necessarily lose their side-branches.

The only mode of propagating the Pine and Fir tribe on a large scale is by seeds; but all the species will succeed by layers, by in-arching on closely-allied kinds, and by herbaceous grafting; and many, if not all, may be propagated by cuttings. The seeds are sown at the end of March, or in April. The ground ought to be in good condition, light and sandy, rather than loamy, and prepared as finely as possible. The seeds may be sown in beds, and, after being gently beaten down with the back of a spade, they should be covered with light soil or leaf-mould, to the depth of a sixteenth, an eighth, or at most a quarter of an inch, according to the size of the seeds, and covered with branches of trees or shrubs, &c. to shade the soil from the sun and protect the seeds from birds. The plants of the greater part of the species come up in from thirty to fifty days, though some do not appear till the second year. Great care must be taken, when the plants are coming through the ground, to raise sufficiently above them the material employed in shading the beds, and also to remove it by degrees. The young plants, in most of the species, grow slowly the first two or three years, and all grow most rapidly between their fifth and tenth years. For a further account of the mode of culture of this interesting family, the reader may consult Loudon's "*Arboretum*." It is a curious fact, and not without its moral, that the young plants of many American species are now imported to our principal sea-ports from England, where they are grown in great numbers and sold at a rate by the thousand with which the American gardener cannot compete.]

METHODICAL DISPOSITION
 OF THE
 PINES AND SPRUCES
 OF
 NORTH AMERICA,
 INCLUDING
 THREE EUROPEAN SPECIES.

Monœcia monadelphica. LINN. *Coniferæ.* JUSS.

TWO-LEAVED PINES.

Cones smooth.

1. Red (Norway) Pine *Pinus rubra.*
2. Stone Pine *Pinus pinea.*
3. Gray Pine *Pinus rupestris.*
4. Yellow Pine *Pinus mitis.*
5. Wild Pine, or Scotch Fir *Pinus sylvestris.*

Cones thorny.

6. Jersey Pine *Pinus inops.*
7. Table Mountain Pine *Pinus pungens.*

THREE-LEAVED PINES.

Cones smooth or with small thorns.

- 8. Long-leaved Pine *Pinus australis.*
- 9. Pond Pine *Pinus serotina.*

Cones very thorny.

- 10. Pitch Pine *Pinus rigida.*
- 11. Loblolly Pine *Pinus taeda.*

FIVE-LEAVED PINES.

- 12. White Pine *Pinus strobus.*

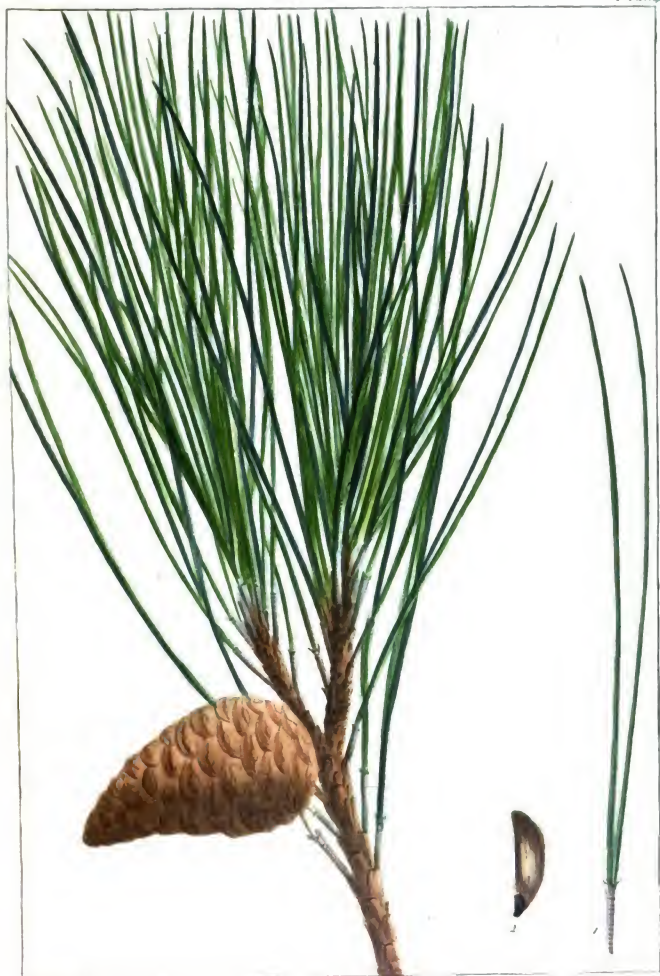
SPRUCES.

Leaves short and disposed singly round the branches.

- 13. Norway Spruce Fir *Abies picea.*
- 14. Black or Double Spruce *Abies nigra.*
- 15. White or Single Spruce *Abies alba.*

Leaves lateral.

- 16. Hemlock Spruce *Abies Canadensis.*
- 17. American Silver Fir *Abies balsamifera.*



Red Pine.
Pinus rubra

RED PINE OR NORWAY PINE.

PINUS RUBRA. *P. arbor maxima; cortice rubente; foliis binis 4-5 uncialibus; vaginis ferè uncialibus; strobilis ovato-conicis, basi rotundatis. folio dimidio-brevioribus, squamis medio dilatatis, inermibus.*

Pinus resinosa. AIR. Hort. Kew.

THIS tree is called, by the French inhabitants of Canada, *Pin rouge*, Red Pine, and the name has been preserved by the English colonists. In the northern parts of the United States it is called Norway Pine, though differing totally from that tree, which is a species of Spruce. The first of these denominations should be adopted by the Americans, especially as it is founded on a distinguishing character of the species, which will be taken notice of in its place.

In a journey made by my father in 1792 to Hudson's Bay for the purpose of remarking, as he returned, the points at which the vegetables of this northern region appear and disappear, he first observed the Red Pine near Lake St. John, in Canada, in the 48th degree of latitude. Toward the south I have not seen it beyond Wilkesbarre, in Pennsylvania, in latitude 41° 30'; and it is rare in all the country south of the river Hudson. It is found in Nova Scotia, where it bears the same name as in Canada, and also that of Yellow Pine. Mackenzie, in the narrative of his journey to the Pacific Ocean, mentions it as existing beyond Lake Superior.

But the Red Pine does not, like the Black Spruce, the Hemlock Spruce, and the White Pine, constitute a large proportion of the extensive forests which cover these regions, but occupies small tracts of a few hundred acres, alone or mingled only with the White Pine. Like most species of this genus, it grows in dry and sandy soils, by which the luxuriance of its vegetation

is not checked, for it is seventy or eighty feet in height and two feet in diameter. It is chiefly remarkable for the uniform size of its trunk for two-thirds of its length.

The bark upon the body of the tree is of a clearer red than upon that of any other species in the United States: hence is derived its popular name, and hence I have substituted the specific epithet *rubra* for that of *resinosa*, employed by Aiton, and adopted by Sir A. B. Lambert. Another motive for the change was to prevent a mistake to which many persons would be liable, of supposing that this species affords the resinous matter so extensively used in ship-building.

The leaves are of a dark green, five or six inches long, united in pairs, and collected in bunches at the extremity of the branches, like those of the Long-leaved Pine and Maritime Pine, *Pinus maritima*, instead of being dispersed, like those of the Jersey and Wild Pines. The female flowers are bluish during the first months after their appearance, and the cones, which are destitute of thorns and which shed their seeds the first year, are about two inches long, rounded at the base, and abruptly pointed.

The concentric circles are crowded in the Red Pine, and the wood when wrought exhibits a fine compact grain. It is rendered heavy by the resinous matter with which it is impregnated, and in Canada, Nova Scotia, and the district of Maine, it is highly esteemed for strength and durability, and is frequently employed in naval architecture, especially for the deck of vessels, for which it furnishes planks forty feet long without knots. Stripped of the sap, it makes very lasting pumps. The mainmast of the St. Lawrence, a ship of fifty guns, built by the French at Quebec, was of this Pine, which confirms my observation concerning its stature.

The Red Pine is exported to England in planks from the district of Maine and the shores of Lake Champlain. I have lately learned that this commerce is diminished, because the



Borea del

natural color

Pinus Pinca.
Stone pine.

timber is said to consist in too great a proportion of sap; but the objection appears to me unfounded: several trunks a foot in diameter, that I have examined, contained only one inch of sap.

While young, the Red Pine has a beautiful aspect, and its vegetation is always vigorous; it would doubtless succeed in France and throughout the North of Europe, and the useful properties of its wood and the resinous matter that might be extracted from it are sufficient inducements to its cultivation. I by no means agree with Sir A. B. Lambert that its wood is always of an inferior quality.

PLATE CXXXIV.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

[The Norway Pine grows as rapidly as the Pitch Pine, whose wood it resembles; but it is more free from resin, and softer.]

STONE PINE.

PINUS PINEA. *P. foliis geminis; strabilis ovatis, obtusis, subinermibus; foliis longioribus; nucibus duris.*

THE isles of the Mediterranean Sea, the shores of European Turkey, and the South of Europe in general, produce this species of Pine. It grows with difficulty in more northern climates, and requires to be protected from the cold while young; in this manner have been reared the stocks that exist in the botanical garden of Paris, which support a winter as rigorous as that of Richmond in Virginia.

The Stone Pine attains the height of fifty-five or sixty feet,

with a diameter of fifteen or twenty inches, and is easily distinguished by its wide and depressed summit. The leaves are about five inches in length, united in pairs, and of a bright green. The cones are five inches long, four inches broad, and very obtuse. On the inner side of each scale, at the base, are two pits containing a hard seed of a deep blue color, surmounted by a short wing. The seeds enclose a white kernel, of an agreeable taste when fresh, which is served upon the table; but there is a Pine known in Portugal by the name of *Pinhao molar*, and in Naples by that of *Piniolo molese*, of which the kernel is tender and in every respect preferable.

The Stone Pine is a conquest of civilized man from savage nature; and a long course of uninterrupted cultivation has been necessary to perfect its fruit. To assign the period at which this process was begun is perhaps impossible; it must, however, be remote, for these cones are found, as an architectural ornament, in the Greek and Roman antiquities.

Though this tree can be of little value to the United States, it deserved to be mentioned, as it grows in the poorest soils, has a picturesque appearance, and is associated with recollections that are cherished by every lover of the arts and sciences.

PLATE CXXXV.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

[A very handsome tree: it will grow in any soil, and in the bleakest situations.]



Grey Pine
Pinus rupestris

GRAY PINE.

PINUS RUPESTRIS. *P. arbor humilis; foliis binis, rigidis, uncialibus; strobilis cinereis, recurvis, insigniter incurvato-tortis; squamis inermibus, ramulo adpressis.*

Pinus Banksiana. LAMBERT.

THIS species is found farther northward than any other American Pine. In Nova Scotia and the district of Maine, where it is rare, it is called *Scrub Pine*, and in Canada, *Gray Pine*. I cannot impart a juster idea of its nature than by an extract from my father's notes upon Canada:—"In the environs of Hudson's Bay, and of the great Mistassin Lakes, the trees which compose the forest a few degrees farther south disappear almost entirely, in consequence of the severity of the winter and the sterility of the soil. The face of the country is almost everywhere broken by innumerable lakes, and covered with large rocks piled upon each other and usually overgrown with large black lichens, which deepen the gloomy aspect of these desolate and almost uninhabited regions. Here and there, in the intervals of the rocks, are seen a few individuals of this species of Pine, which fructify, and even exhibit the appearance of decrepitude, at the height of three feet. One hundred and fifty miles farther south its vegetation is more vigorous, but it is still not more than eight or ten feet high; and in Nova Scotia, where it is confined to the summit of the rocks, it rarely exceeds this stature."

The leaves of the Gray Pine are united in pairs in the same sheath; but they are disseminated over the branches instead of being collected at the extremity, and are about an inch long, flat on the interior, and rounded on the exterior face. The cones are commonly in pairs, and are of a gray or ashy color, which has probably lent its name to the tree: they are about two

inches long, and have the peculiarity of always pointing in the same direction with the branches; they are, besides, remarkable for naturally assuming an arching shape, which gives them the appearance of small horns. They are extremely hard, and do not open to release the seeds before the second or third year. The Canadians find a speedy cure for obstinate colds in a diet-drink made by boiling these cones in water. If this property, which is said to belong also to the fruit of the Black Spruce, is proved to exist, it forms the only merit of a tree too diminutive to be of any other utility; in my opinion, Sir A. B. Lambert mistakes in supposing it capable of furnishing turpentine or tar as an article of commerce.

PLATE CXXXVI.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

YELLOW PINE.

PINUS MITIS. *P. arbor maxima; foliis prælongis, tenuioribus, caniculatis; strobilis, parvis, sæpe solitariis, conoidco-ovatis; tessularum mucrone minutissimo.*

Pinus mitis. MICH. Flor. Bor. Am.

THIS tree is widely diffused in North America, and is known in different places by different names: in the Middle States, where it is abundant and in common use, it is called Yellow Pine; in the Carolinas and Georgia, Spruce Pine, and more frequently Short-leaved Pine.

Toward the north, this species is not found beyond certain districts of Connecticut and Massachusetts; it is multiplied in



Yellow Pine.
Pinus mitis.

the lower part of New Jersey, and still more on the Eastern Shore of Maryland and in the lower parts of Virginia, where it is seen only upon arid soils. I have also met with it on the right bank of the river Hudson, at a little distance from Albany, at Chambersburg in Pennsylvania, near Mudlick in Kentucky, on the Cumberland Mountains, and in the vicinity of Knoxville in East Tennessee, at Edgefield Court-house in the upper part of South Carolina, and on the river Oconee in the upper part of Georgia. In all these places it is united with other trees, and enters in a greater or less proportion into the composition of the forests, according to the nature of the soil. It abounds on the poorest lands; on those of a certain degree of fertility, which is indicated by the flourishing appearance of the Oaks and Walnuts, it is more rare, though it still surpasses the surrounding trees in bulk and elevation. The Yellow Pine is also occasionally seen in the lower part of the Carolinas, in the Floridas, and probably in Louisiana; but in these regions it grows only in spots consisting of beds of red clay mingled with gravel, which here and there pierce the light covering of sand which forms the surface of the country to the distance of 120 miles from the sea.

The Yellow Pine is a beautiful tree; and this advantage it owes to the disposition of its limbs, which are less divergent the higher they are placed upon the stock, and which are bent toward the body so as to form a summit regularly pyramidal, but not spacious in proportion to the dimensions of the trunk. Its regularity has perhaps given rise to the name of *Spruce Pine*.

In New Jersey and in Maryland, this tree is fifty or sixty feet high, and is commonly of a uniform diameter of fifteen or eighteen inches for two-thirds of this distance; in Virginia and the upper part of the Carolinas, there are stocks of nearly the same height and of twice this diameter; I have measured several that were between five and six feet in circumference.

The leaves are four or five inches long, fine, flexible, hollowed

on the inner face, of a dark green, and united in pairs; sometimes, from the luxuriance of vegetation, they are found together on the shoots of the season, but never upon the older branches; there is, therefore, an inaccuracy in the description of this species as a Pine with *two or three leaves*, and in the specific epithet *variabilis*.

The cones are oval, armed with fine spines, and smaller than those of any other American Pine, since they scarcely exceed an inch and a half in length upon old trees. The seeds are cast the first year.

The concentric circles of the wood are six times as numerous in a given space as those of the Pitch and Loblolly Pines. In trunks fifteen or eighteen inches in diameter there are only two inches, or two and a half, of sap, and still less in such as exceed this size. The heart is fine-grained and moderately resinous, which renders it more compact without great weight. Long experience has proved its excellence and durability. In the Northern and Middle States, and in Virginia, to the distance of 150 miles from the sea, nine-tenths of the houses are built entirely of wood, and the floors, the casings of the doors and wainscots, the sashes of the windows, &c. are made of this species, as more solid and lasting than any other indigenous wood. In the upper part of the Carolinas, where the Cypress and White Cedar do not grow, the houses are constructed wholly of Yellow Pine, and are even covered with it. But, for whatever purpose it is employed, it should be completely freed from the sap, which speedily decays. This precaution is sometimes neglected in order to procure wider boards, especially near the ports, where, from the constant consumption, the tree is becoming rare. Immense quantities are used in the dock-yards of New York, Philadelphia, Baltimore, &c. for the docks, masts, yards, beams, and cabins of vessels, and it is considered as next in durability with the Long-leaved Pine. The wood from New Jersey and Maryland is finer-grained, more compact, and



Brown del.

Gabriel sculp.

Wild Pine or Scotch Fir.
Pinus sylvestris.

stronger, than that from the river Delaware, which grows upon richer lands.

The Yellow Pine, in boards from one inch to two and a half inches thick, forms a considerable article of exportation to the West Indies and Great Britain: in the advertisements of Liverpool it is designated by the name of *New York Pine*, and in those of Jamaica by that of *Yellow Pine*; in both places it is sold at a lower price than the Long-leaved Pine of the Southern States, but much higher than the White Pine.

Though this species yields turpentine and tar, their extraction demands too much labor, as it is always mingled in the forests with other trees. The value of its wood alone renders it, for the middle and North of Europe, the most interesting, except the Red Pine, of the American species. Sir A. B. Lambert begins his Latin description of it thus:—*Arbor mediocris, &c.*; and adds that “it does not exceed twenty-five or thirty feet in height, is of a spongy consistence, and unfit for building.”

PLATE CXXXVII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

WILD PINE OR SCOTCH FIR.

PINUS SYLVESTRIS. P. foliis geminis rigidis, strobilis ovato-conicis, longitudine foliorum; squamis echinatis.

THE Pines of the Old Continent are less numerous than those already observed in North America. Among them, the Wild Pine is the most valuable for the properties of its wood; it is, besides, extensively diffused, and grows in the most dissimilar soils.

In that part of Europe which lies above the 55th degree of latitude are found immense forests of resinous trees, in general composed entirely of this species; below this parallel the leafy trees begin to mingle with them, and soon exclude them from the forests. In the centre of Europe the Wild Pine abounds only in the coldest and most elevated situations, such as the Pyrenees, the Tyrolean, Swiss, and Vosgian Mountains. In Scotland, it is so common as to leave no doubt of its being indigenous to that kingdom, though some authors believe it to have come originally from the continent.

This tree arrives at perfection only in the North of Europe, where it is more than eighty feet high and four or five feet in diameter. The full-grown trunk is covered with a thick and deeply-furrowed bark; the leaves are in pairs, of a pale green, stiff, twisted, and about three inches long; the flowers are of a yellowish tint, and the cones are grayish, of a middling thickness, and a little shorter than the leaves. Each scale is surmounted by a retorted spine: the seeds are small, black, and garnished with a reddish wing; they ripen the second year.

The great elevation of the Wild Pine, its uniform diameter, and the excellent quality of its wood, resulting from a just proportion of resinous fluid, render it peculiarly proper for the masts of large ships, and for an infinite variety of secondary uses. A considerable exportation takes place from the North of Europe, especially from Riga, Memel, and Dantzic, to the maritime states, particularly to England, where, according to Sir A. B. Lambert, it is known by the name of *Red Deal*, and in London by that of *Yellow Deal*. In Poland and Russia, the houses in the country are generally constructed of it. This species furnishes four-fifths of the tar consumed in the dock-yards of Europe, which is imported from Archangel, Riga, and other ports of Russia and Norway.

In the North of Europe, great ravages are committed in the forests composed of the Wild Pine and Norway Spruce Fir by

several insects, of which the most destructive is the *Bostrichus piniperada*. This little animal introduces itself into the cellular tissues of the bark, and succeeds in dividing it from the trunk. The separation of the bark prevents the circulation of the sap, and hence results the inevitable death of the tree. It is impossible to oppose an effectual resistance to this winged enemy; but I have been informed by a Polish gentleman that its progress is sometimes arrested by felling all the trees, for the space of fifty yards in breadth, between the part of the forest which it already occupies and that which it threatens to assail.

The faculty which I have ascribed to the Wild Pine of growing in climates, soils, and exposures extremely different, is of inestimable value, and its cultivation has been successfully attempted on lands abandoned during ages of hopeless sterility. Plantations may be formed from the seed, or with young stocks from the nursery: of all the Pines, this species bears transplanting with the least injury. It is seen flourishing on sandy wastes exposed to the saline vapors of the sea, and, which is more remarkable, on calcareous lands, a large tract of which, in the Department of the Marne, called *la Champagne pouilleuse*, has begun within forty years to be covered with it, after lying desert from time immemorial. The proprietors who first conceived this fortunate plan have already seen their barren grounds acquire a tenfold value. The oldest plantations yield seeds, which are disseminated by the winds and spring up spontaneously. After the first growth of evergreen trees, the soil becomes capable of sustaining the Birch, the Hornbeam, the Oaks, &c., which in time renders it proper for the production of cereal plants. In Belgium, large heaths have in this way been transformed into rich, arable land.

The culture of the Wild Pine has been found so profitable that seeds or young plants may everywhere be obtained at a moderate price. April is the most favorable season for sowing the seeds or removing the young stocks: six or eight pounds of

seed should be scattered upon an acre of ground previously sown with half the usual quantity of oats; the roller suffices to cover them. The oats preserve a degree of coolness in the soil, and shelter the young Pines from the ardor of the sun; but great care must be taken not to injure them in the harvest.

The Wild Pine is so different from the White Pine in its foliage, the form of its cones, and the quality of its wood, that no comparison can be instituted between them: it is more analogous to the Yellow Pine, to which, however, it is superior. It might be most profitably cultivated on waste lands in the northern section of the United States.

PLATE CXXXVIII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed. Fig. 3. Bostrichus piniperada, or Dermestes typographus, of the natural size. Fig. 4. The same insect enlarged.

[This tree prefers a dry, deep loam, and a somewhat elevated situation. Though not handsome, it is well adapted to cold-looking, rugged scenery.]



Pinus strobus

Pinus strobus

Jersey Pine.
Pinus strobus.

NEW JERSEY PINE.

PINUS INOPS. *P. arbor mediocris, ramosa; foliis binis, brevibus; strobilis ovato-acuminatis, solitariis, fuscis; mucronibus tessularum rigidis; deorsum sub-inclinatis.*

OBS. Truncus et ramuli obscure et squalide fusi.

THE Jersey Pine has probably been so named from its abounding in the lower part of New Jersey, where the soil is meagre and sandy, and where it is often accompanied by the Yellow Pine. It is not, however, confined to this State; for I have seen it in Maryland, Virginia, and Kentucky, in Pennsylvania beyond Chambersburg, near the Juniata, and on the scrubby ridges beyond Bedford, at the distance of about two hundred miles from Philadelphia. In this part of Pennsylvania it is called *Scrub Pine*, and is seen wherever the soil is composed of argillaceous schist and is consequently poor. The leanness of the land on which it grows is attested by the decrepit appearance of the Scarlet, Red, Black, White, and Rock Chestnut Oaks, with which it is mingled. I have never met with it northward of the river Hudson, nor in the Carolinas and Georgia.

This tree is sometimes thirty or forty feet high and twelve or fifteen inches in diameter, but it rarely attains these dimensions. The trunk, which is clad in a blackish bark, tapers sensibly from the base to the summit, and half its length is occupied by limbs remote from each other. The leaves are united in pairs and are of a dark green, one or two inches long, flat on the inner face, stiff, and scattered over the young branches, which are very flexible and smooth, while those of the other species are scaly. The wood of the annual shoots is observed to be of

1220.



P. P. Boscawen del.

coloured by G.

Table Mountain Pine.
Pinus pungens.

TABLE MOUNTAIN PINE.

PINUS PUNGENS. *P. arbor 45-50 pedalis; foliis binis, brevibus et crassis; strobilis turbinatis, præmagnis, flavis, squamis echinatis, spinis luteis, durissimis et basi latioribus.*

THE Table Mountain, in North Carolina, one of the highest points of the Alleghanies, at the distance of nearly 300 miles from the sea, has given its name to this species of Pine, which covers it almost exclusively, though it is rare on the neighboring summits. Nor is it found in any other part of the United States, as my father and myself have become assured by extensive researches. Of all the forest trees of America this species alone is restricted to such narrow limits, and it will probably be among the first to become extinct, as the mountains which produce it are easy of access, are favored with a salubrious air and a fertile soil, and are rapidly peopling; besides which, their forests are frequently ravaged by fire.

The Table Mountain Pine is forty or fifty feet in height, with a proportional diameter. The buds are resinous, and the leaves, which grow in pairs, are thick, stiff, and about two and a half inches in length. The cones are about three inches long and two inches in diameter at the base, of a regular form and a light yellow color: they are sessile, and often united to the number of four. Each scale is armed with a strong, ligneous spine, two lines in length, widened at the base, and bent toward the summit of the cone.

This tree divides itself in numerous ramifications. It is appropriated to no particular use, but in the mountains of North Carolina its turpentine is preferred to every other as a dressing for wounds. I cannot discover the slightest difference between this resin and that of the Pitch Pine; and it is a remarkable

fact that all the Pines, though differing widely from each other, yield a resin so analogous as often to be indistinguishable by the taste and smell.

The Table Mountain Pine has no valuable properties to recommend it to notice in Europe; it will serve only to complete botanical collections and to diversify pleasure-grounds.

PLATE CXL.

A branch with a cone of the natural size.

LONG-LEAVED PINE.

PINUS PALUSTRIS. *P. arbor maxima; foliis ternis longissimis; amentis masculis longo-cylindraceis, fusco-glaucis, divergentibus; strobilis longissime conoideis, tessularum tuberculo tumido, mucrone minutissimo terminato.*

THIS invaluable tree is known both in the countries which produce it, and in those to which it is exported, by different names; in the first it is called Long-leaved Pine, Yellow Pine, Pitch Pine, and Broom Pine; in the Northern States, Southern Pine and Red Pine; and in England and the West Indies, Georgia Pitch Pine. I have preferred the first denomination, because this species has longer leaves than any other eastward of the Mississippi, and because the name of Yellow Pine and Pitch Pine, which are more commonly employed, serve in the Middle States to designate two species entirely distinct and extensively diffused. The specific epithet *australis* is more appropriate than that of *palustris*, which has hitherto been ap-



C. A. Bolander del.

Pinus, etc.

Long Leaved Pine.
Pinus australis.

plied to it by botanists, but which suggests an erroneous idea of the situations in which it grows.

Toward the north, the Long-leaved Pine first makes its appearance near Norfolk, in Virginia, where the pine-barrens begin. It seems to be especially assigned to dry, sandy soils, and it is found almost without interruption in the lower parts of the Carolinas, Georgia, and the Floridas, over a tract more than six hundred miles long from northeast to southwest, and more than one hundred miles broad from the sea toward the mountains of the Carolinas and Georgia. I have ascertained three points, about one hundred miles apart, where it does not grow:—the first, eight miles from the river Neuse, in North Carolina, on the road from Louisburg to Raleigh; the second, between Chester and Winesborough, in South Carolina; the third, twelve miles north of Augusta, in Georgia. Where it begins to show itself toward the river Neuse, it is united with the Loblolly Pine, the Yellow Pine, the Pond Pine, the Black Jack Oak, and the Scrub Oak; but immediately beyond Raleigh it holds almost exclusive possession of the soil, and is seen, in company with the Pines just mentioned, only on the edges of the swamps enclosed in the barrens; even there not more than one stock in a hundred is of another species. With this exception, the Long-leaved Pine forms the unbroken mass of woods which covers this extensive country. But between Fayetteville and Wilmington, in North Carolina, the Scrub Oak is found in some districts disseminated in the barrens, and, except this species of Pine, it is the only tree capable of subsisting in so dry and sterile a soil.

The mean stature of the Long-leaved Pine is sixty or seventy feet, with a uniform diameter of fifteen or eighteen inches for two-thirds of this height. Some stocks, favored by local circumstances, attain much larger dimensions, particularly in East Florida. The bark is somewhat furrowed, and the epidermis detaches itself in thin transparent sheets. The leaves are

about a foot long, of a beautiful, brilliant green, united to the number of three in the same sheath, and collected in bunches at the extremity of the branches: they are longer and more numerous on the young stocks, which are sometimes cut by the negroes for brooms. The buds are very large, white, fringed, and not resinous.

The bloom takes place in April; the male flowers form masses of divergent violet-colored aments about two inches long; in drying they shed great quantities of yellowish pollen, which is diffused by the wind and forms a momentary covering on the surface of the land and water. The cones are very large, being seven or eight inches long, and four inches thick when open, and are armed with small retorted spines. In the fruitful year they are ripe about the 15th of October, and shed their seed the same month. The kernel is of an agreeable taste, and is contained in a thin, white shell, surmounted by a membrane; in every other species of American Pine the shell is black. Sometimes the seeds are very abundant, and very voraciously eaten by wild turkeys, squirrels, and the swine that live almost wholly in the woods. But in the unfruitful year, a forest of a hundred miles in extent may be ransacked without finding a single cone: this, probably, occasioned the mistake of the French who, in 1567, attempted a settlement in Florida, that "the woods were filled with superb Pines that never yielded seed.

The Long-leaved Pine contains but little sap; several trunks fifteen inches in diameter at the height of three feet, which I have myself measured, had ten inches of perfect wood. Many stocks of this size are felled for commerce, and none are received for exportation of which the heart is not ten inches in diameter when squared. The concentric circles in a trunk fully developed are close and at equal distances, and the resinous matter, which is abundant, is more uniformly distributed than in the other species; hence, the wood is stronger, more compact, and more durable: it is, besides, fine-grained, and susceptible of a bright

polish. These advantages give it a preference over every other Pine: but its quality is modified by the nature of the soil in which it grows; in the neighborhood of the sea, where only a thin layer of mould reposes on the sand; it is more resinous than where the mould is five or six inches thick; the stocks that grow upon the first-mentioned soil are called Pitch Pine, and the others Yellow Pine, as if they were distinct species.

This wood subserves a great variety of uses; in the Carolinas, Georgia, and the Floridas, four-fifths of the houses are built of it, except the roof, which is covered with shingles of Cypress; but in the country the roof is also of Pine, and is renewed after fifteen or eighteen years,—a considerable interval in a climate so warm and humid. A vast consumption takes place for the enclosure of cultivated fields. In naval architecture this is the most esteemed of the Pines: in the Southern States, the keel, the beams, the side-planks, and the pins by which they are attached to the ribs, are of this tree. For the deck it is preferred to the true Yellow Pine, and is exported for that purpose to Philadelphia, New York, &c., where it is in request also for the flooring of houses.

In certain soils its wood contracts a reddish hue, and it is for that reason known in the dock-yards of the Northern States by the name of Red Pine. Wood of this tint is considered the best, and, in the opinion of some shipwrights, it is more durable on the sides of vessels, and less liable to injury from worms, than the Oak.

The Long-leaved Pine is the only species exported from the Southern States to the West Indies. A numerous fleet of small vessels is employed in this traffic, particularly from Wilmington, in North Carolina, and Savannah, in Georgia. The stuff destined for the colonial market is cut into every form required in the construction of houses and of vessels; what is sent to England is in planks from fifteen to thirty feet long and ten or twelve inches broad; they are called *ranging timbers*. The ves-

sels freighted with this timber repair chiefly to Liverpool, where it is said to be employed in the building of ships and of wet-docks: it is called Georgia Pitch Pine, and is sold twenty-five or thirty per cent. higher than any other Pine imported from the United States.

From the diversified uses of this wood an idea may be formed of the consumption; to which must be added a waste of a more disastrous kind, which it seems impossible to arrest. Since the year 1804, extensive tracts of the finest Pines are seen covered only with dead trees. In 1802, I remarked a similar phenomenon among the Yellow Pines, in East Tennessee. This catastrophe is felt among the Scotch Firs which people the forests of the North of Europe, and is wrought by swarms of small insects, which lodge in different parts of the stock, insinuate themselves under the bark, penetrate into the body of the tree, and cause it to perish in the course of the year.

The value of the Long-leaved Pine does not reside exclusively in its wood: it supplies nearly all the resinous matter used in the United States in ship-building, and a large residue for exportation to the West Indies and Great Britain. In this view, its place can be supplied by no other species, those which afford the same product being dispersed through the woods or collected in inaccessible places. In the Northern States, the lands which, at the commencement of their settlement, were covered with the Pitch Pine, were exhausted in twenty-five or thirty years, and for more than half a century have ceased to furnish tar.

The pine-barrens are of vast extent, and are covered with trees of the finest growth; but they cannot all be rendered profitable, from the difficulty of communication with the sea. Formerly, tar was made in all the lower parts of the Carolinas and Georgia, and throughout the Floridas vestiges are everywhere seen of kilns that have served in the combustion of resinous wood. At present, this branch of industry is confined to

the lower districts of North Carolina, which furnish almost all the tar and turpentine exported from Wilmington and other ports.

The resinous product of the Pine is of six sorts,—viz.: turpentine, *scrapings*, spirit of turpentine, rosin, tar, and pitch. The two last are delivered in their natural state; the others are modified by the agency of fire in certain modes of preparation. More particularly, turpentine is the sap of the tree obtained by making incisions in its trunk. It begins to distil about the middle of March, when the circulation commences, and flows with increasing abundance as the weather becomes warmer, so that July and August are the most productive months. When the circulation is slackened by the chills of autumn, the operation is discontinued, and the remainder of the year is occupied in preparatory labors for the following seasons, which consist—first, in making the *boxes*. This is done in January and February: in the base of each tree, about three or four inches from the ground, and of preference on the south side, a cavity is formed, commonly of the capacity of three pints, but proportioned to the size of the trunk, of which it should occupy a quarter of the diameter; on stocks more than six feet in circumference, two, and sometimes four, *boxes* are made on opposite sides. Next comes the *raking*, or the clearing of the ground at the foot of the trees from leaves and herbage, by which means they are secured against the fires that are often kindled in the woods by the carelessness of travellers and wagoners. If the flames gain the *boxes* already impregnated with turpentine, they are rendered useless, and others must be made. *Notching* is merely making at the sides of the box two oblique gutters, about three inches long, to conduct into it the sap that exudes from the edges of the wound. In the interval of a fortnight, which is employed in this operation, the first boxes become filled with sap. A wooden shovel is used to transfer it to pails, which in turn are emptied into casks placed at convenient distances. To increase the pro-

duct, the upper edge of the box is *chipped* once a week, the bark and a portion of the alburnum being removed to the depth of four concentric circles. The boxes fill every three weeks. The turpentine thus procured is the best, and is called *pure dipping*.

The *chippings* extend the first year a foot above the box, and, as the distance increases, the operation is more frequently repeated, to remove the sap coagulated on the surface of the wound. The closing of the pores, occasioned by continued rains, requires the same remedy; and it is remarked that the produce is less abundant in moist and cool seasons. After five or six years, the tree is abandoned; the upper edge of the wound becomes cicatrized, but the bark is never restored sufficiently for the renewal of the process.

It is reckoned that 250 boxes yield a barrel containing 320 pounds. Some persons charge a single negro with the care of 4000 or 4500 trees of one box; others, of only 3000, which is an easy task. In general, 3000 trees yield, in ordinary years, seventy-five barrels of turpentine and twenty-five of *scraping*, which supposes the boxes to be emptied five or six times in the season. The *scraping* is a coating of sap which becomes solid before it reaches the boxes, and which is taken off in the fall and added to the last runnings. In November, 1807, the *pure dipping* was sold at Wilmington at three dollars a barrel, and the *scraping* a quarter less.

In 1804, the exportation to the Northern States and to the English possessions amounted to 77,827 barrels. During peace it comes even to Paris, where it is called Boston turpentine. Throughout the United States it is used to make yellow soap of a good quality. The consumption in England is great, and, in the official statements, the value imported in 1807 is 465,828 dollars; in 1805, Liverpool alone received 40,294 barrels, and in 1807, 18,924 barrels. It sold there in August, 1807, at three dollars a hundred pounds, and, after the American embargo, in 1808, at eight or nine dollars. Oddy omits, in his list of articles

exported from Archangel and Stockholm to Great Britain, the resinous product of the Pine, which has amounted to 100,000 barrels of tar in a year.

A great deal of spirits of turpentine is made in North Carolina; it is obtained by distilling the turpentine in large copper retorts, which are of an imperfect shape, being so narrow at the mouth as to retard the operation. Six barrels of turpentine are said to afford one cask, or 122 quarts, of the spirit. It is sent to all parts of the United States, even to the Western country by the way of Philadelphia, to England, and to France, where it is preferred, as less odorous, to that made near Bordeaux. In 1804, 19,526 gallons were exported from North Carolina. The residuum of the distillation is *rosin*, which is sold at one-third of the price of turpentine. The exportation of this substance, in 1804, was 4675 barrels.

All the tar of the Southern States is made from dead wood of the Long-leaved Pine, consisting of trees prostrated by time or by the fire kindled annually in the forests, of the summits of those that are felled for timber, and of limbs broken off by the ice which sometimes overloads the leaves.*

It is worthy of remark that the branches of resinous trees consist almost wholly of *wood*, of which the organization is even more perfect than in the body of the tree; the reverse is observed in trees with deciduous leaves: the explanation of the phenomenon I leave to persons skilled in vegetable physiology. As soon as vegetation ceases in any part of the tree, its consistence speedily changes; the sap decays, and the heart, already impregnated with resinous juice, becomes surcharged to such a degree as to double its weight in a year; the accumulation is said to be much greater after four or five years: the general fact may be proved by comparing the wood of trees recently felled, and of others long since dead.

* See "Travels West of the Alleghanies," by F. A. Michaux. Paris, 1803. Vol. III.—8

To procure the tar, a *kiln* is formed in a part of the forest abounding in dead wood: this is first collected, stripped of the sap, and cut into billets two or three feet long and about three inches thick; a task which is rendered long and difficult by the knots. The next step is to prepare a place for piling it: for this purpose a circular mound is raised, slightly declining from the circumference to the centre, and surrounded with a shallow ditch. The diameter of the pile is proportioned to the quantity of wood which it is to receive; to obtain one hundred barrels of tar, it should be eighteen or twenty feet wide. In the middle is a hole, with a conduit leading to the ditch, in which is formed a receptacle for the resin as it flows out. Upon the surface of the mound, beaten hard and coated with clay, the wood is laid round in a circle like rays.

The pile, when finished, may be compared to a cone truncated at two-thirds of its height, and reversed, being twenty feet in diameter below, twenty-five or thirty feet above, and ten or twelve feet high. It is then strewed with pine leaves, covered with earth, and contained at the sides with a slight cincture of wood. This covering is necessary in order that the fire kindled at the top may penetrate to the bottom with a slow and gradual combustion; if the whole mass was rapidly inflamed, the operation would fail and the labor in part be lost; in fine, nearly the same precautions are exacted in this process as are observed in Europe in making charcoal. A kiln which is to afford one hundred or one hundred and thirty barrels of tar is eight or nine days in burning.

As the tar flows off into the ditch, it is emptied into casks of thirty gallons, which are made of the same species of wood.

Pitch is tar reduced by evaporation: it should not be diminished beyond half its bulk to be of a good quality.

In 1807, tar and pitch were exported to England from the United States to the amount of \$265,000; the tar was sold at Liverpool, in August of the same year, at \$4.67 a barrel, and,

when the embargo became known, at \$5.56: from which inferences may be drawn to the advantage of the United States. At Wilmington, the ordinary price is from \$1.75 to \$2.20 a barrel.

Oddy informs us that the tar brought to England between 1786 and '99 came in equal proportions from Russia, Sweden, and the United States; only a very small quantity was drawn from Denmark. The Swedish tar is the most highly esteemed in commerce, and next that of Archangel; that of the United States is considered inferior to both, which is owing to its being made from dead wood, while that of Europe is extracted from trees recently felled: I shall speak more particularly of the difference arising from this cause in the description of the Pitch Pine. The tar of Carolina is said also to contain earth; this can be attributable only to want of care in preparing the receptacles: if the same pains were taken in its preparation, it would probably equal that of Europe, though it must be considered that the tar of Russia and Sweden is produced by a different tree, a native of the North of Europe. It has already been remarked that in the United States this manufacture is confined to the maritime part of North Carolina, and to a small tract of Virginia: but, according to the rate of consumption in America and Great Britain, the product would not long suffice if all the extensive regions covered with the Long-leaved Pine were made to contribute to this object; for the dead wood is said not to be renewed upon a tract that has been cleared, in less than ten or twelve years. It might be advantageous to make use of green wood, or purposely to strip the trees of their bark; and perhaps in this way supplies might be obtained equivalent to the demands of commerce.

Great benefit would result from stripping the Pines of a certain diameter, of their bark: they would pass completely into the resinous state in fifteen months, and would be proper for posts and many other uses which require strong and lasting

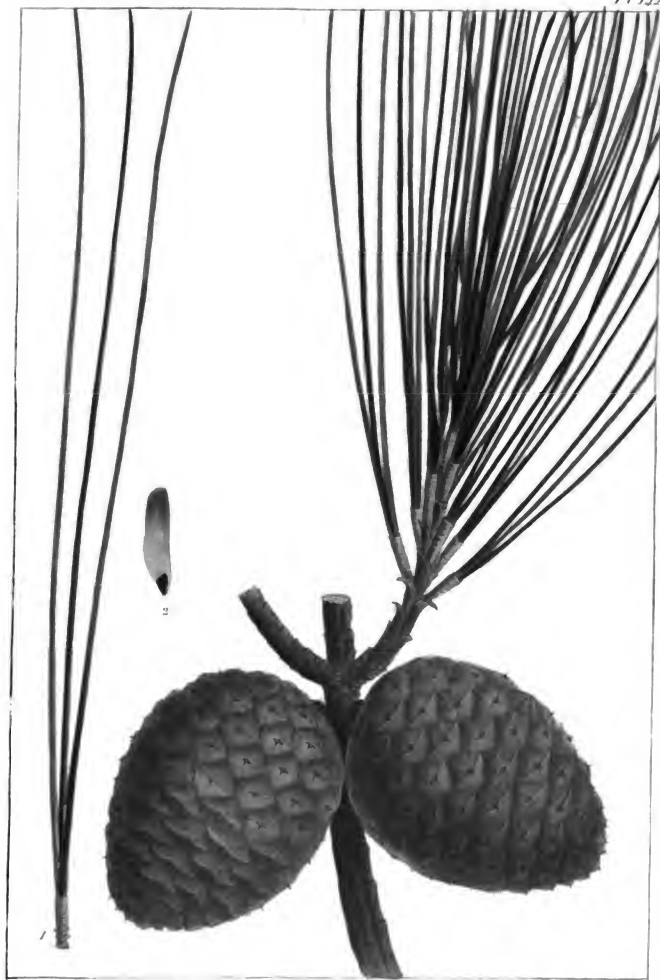
wood. This experiment, which I should have tried when I was last in South Carolina if the season had not been too far advanced, should be made in April or the beginning of May, while the sap is in active circulation, and the *liber* or inner bark should be exactly removed.

I cannot conclude this protracted article without expressing a wish that the Long-leaved Pine should be introduced upon the wastes near Bordeaux; the soil and climate are perfectly congenial to it, and it would succeed better than in the more northern departments. It would be a valuable addition to our domestic resources, for its wood is superior to that of any Pine of North America, and, as I have proved by comparison, to that of the Bordeaux and Riga Pines. The Red and Yellow Pines, also, are shown to be superior to these European species, by samples which I brought from America.

The figure of the Long-leaved Pine, in Sir A. B. Lambert's work, is correct in the leaves and fruit, but defective in the male flowers. His description is wholly inconsistent with my own observations. The Latin phrase begins thus:—"*Pinus palustris, arbor mediocris, in paludosis, &c.*" The wood is of a reddish-white color, soft, light, and very sparingly impregnated with resin. It soon decays, burns badly, and is so little esteemed that it is not used while any other species of wood can be procured."

PLATE CXLI.

Fig. 1. A leaf. Fig. 2. A bud. Fig. 3. A seed.



Pinus serotina

Pinus serotina

Pond Pine.
Pinus serotina.

POND PINE.

PINUS SEROTINA. *P. arbor 40–45 pedalis; foliis ternis prælongis; amentis masculis erecto-incumbentibus; strobilis ovatis, tessularum mucrone minutissimo.*

THE Pond Pine frequently recurs in the maritime parts of the Southern States, but is lost as it were among the Long-leaved Pines which cover these regions, and, as it is appropriated to no use, and bears a strong family-likeness to the rest of the genus, it has received no popular specific name; that which I have given it seems sufficiently appropriate, since it grows principally on the borders of ponds covered with the Pond Bush, *Laurus æstivalis*, and in the small swamps, whose black and miry soil is shaded by the Loblolly Bay, Red Bay, Tupelo, and Small Magnolia or White Bay.

The leaves, united to the number of three, are five or six inches in length, and a little more upon young stocks. The aments are straight, and six or eight lines long; the cones are commonly opposite and in pairs, two and a half inches in length, five and a half inches in circumference, and in form like an egg; their scales are rounded at the extremity, and armed with fine short spines which are easily broken off, so that in some instances no vestige is left of their existence. The cones arrive at maturity the second year, but do not release their seeds before the third or fourth.

The ordinary size of the tree, which it rarely exceeds, is thirty-five or forty feet in height and fifteen or eighteen inches in diameter. It is remarkable for the remoteness of its branches, which begin to spring upon the lower half of the stock; and more than half of the largest trunks consist of sap:

for these reasons the species is useless at home and deservedly neglected abroad.

Observation. The Pond Pine sometimes grows with the Long-leaved Pine in abandoned fields near the swamps. The dryness of the soil occasions no difference in its form. This observation is important, as the species under consideration is frequently confounded with the Pitch Pine, which it strikingly resembles.

PLATE CXLII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

PITCH PINE.

PINUS RIGIDA. *P. arbor ramosa; cortice scabro-rimosa; gemmis resinosi; foliis ternis; amentis masculis erecto-incumbentibus; strobilis sparsis vel aggregatis; squamis echinatis; spinis rigidis.*

THIS species is known in all the United States by the name of *Pitch Pine*, and sometimes in Virginia by that of *Black Pine*, but nowhere by that of *Three-leaved Virginian Pine*, which is used by Sir A. B. Lambert.

Except the maritime parts of the Atlantic States, and the fertile regions west of the Alleghany Mountains, it is found throughout the United States, but most abundantly upon the Atlantic coast, where the soil is diversified but generally meagre. The vicinity of Brunswick, in the district of Maine, and of Burlington on Lake Champlain, in the State of Vermont, are the most northern points at which I have observed it; in these places it commonly grows in light, even, friable, sandy soils,



Bacca del.

Pitch Pine
Pinus rigida.

which it occupies almost exclusively. It does not exceed twelve or fifteen feet in height, and its slender branches, laden with puny cones, evince the feebleness of its vegetation.

In Pennsylvania and Virginia, the ridges of the Alleghanies are sometimes covered with it, as I have remarked in travelling from Philadelphia to Pittsburg, and particularly in traversing the South Mountains, on the ridge called Saddle Hill, thirty miles from Bedford. Here the soil is a little more generous, consisting of clay thickly sown with stones, and the Pitch Pine is thirty-five or forty feet high and twelve or fifteen inches in diameter.

In the lower part of New Jersey, Pennsylvania, and Maryland, it is frequently seen in the large swamps filled with the Red Cedar, which are constantly miry or covered with water; in such situations it is seventy or eighty feet high and from twenty to twenty-eight inches in diameter, and exceeds the surrounding trees both in bulk and elevation. It supports a long time the presence of sea-water, which in spring-tides overflows the salt meadows, where it is sometimes found alone of its genus.

The buds of the Pitch Pine are always resinous, and its triple leaves vary in length from an inch and a half to seven inches, according to the degree of moisture in the soil. The aments are an inch long, straight, and winged like those of the Pond Pine. The size of the cones depends upon the nature of the soil, and varies from less than an inch to more than three inches in length; they are of a pyramidal shape, and each scale is pointed with an acute spine about two lines long. Wherever these trees grow in masses the cones are dispersed singly over the branches; and, as I have learned by constant observation, they release the seeds the first autumn after their maturity; but on solitary stocks, exposed to the buffeting of the winds, the cones are collected in groups of four, five, or even a larger number, and remain closed for several years. This clustering

of the cones serves, also, to distinguish the Jersey and Table Mountain Pines.

The Pitch Pine has a thick, blackish, deeply-furrowed bark. It is remarkable for the number of its branches, which occupy two-thirds of its trunk and render the wood extremely knotty. The concentric circles are widely distant, and three-fourths of the larger stocks consist of sap. On mountains and gravelly lands the wood is compact, heavy, and surcharged with resin, whence is derived the name of *Pitch Pine*: in swamps, on the contrary, it is light, soft, and composed almost wholly of sap; it is then called *Sap Pine*. These essential defects place it below the Yellow Pine; but, as that species is daily dwindling by the vast consumption in civil and naval architecture, it is partially replaced by the Pitch Pine, the poorer variety of which is used for the boxes employed in packing certain sorts of merchandise, such as soap, candles, &c.

On some parts of the Alleghanies, where this tree abounds, houses are built of it, and the wood, if it is not covered with paint, is recognised by its numerous knots. It is thought better than the Yellow Pine for floors that are frequently washed, as the resin with which it is impregnated renders it firmer and more durable. It serves perfectly well for ship-pumps, for which purpose trees with very little heart are preferred. The bakers of New York, Philadelphia, and Baltimore, and the brick-makers in the vicinity of these cities, consume it in prodigious quantities. From the most resinous stocks is procured the lamp-black of commerce.

The Pitch Pine seems to have formerly abounded in Connecticut, Massachusetts, and New Hampshire; for, since the beginning of the seventeenth century till 1776, they have furnished a certain quantity of tar. About the year 1705, upon a misunderstanding with Sweden, whence she had drawn her supplies, Great Britain encouraged this branch of industry in the northern part of America by a premium of one pound ster-

ling for eight barrels of tar made from dead wood, and of two pounds for the same quantity extracted from green trees. The method of depriving the trees of their bark and felling them the following year, the excellence of which has since been proved by Buffon's experiments on the conversion of alburnum into perfect wood, and which might be profitably applied in the United States, was published and disseminated. In consequence of this encouragement, or from other causes, the destruction has been so rapid that the Northern States no longer furnish turpentine or tar for their own consumption. The little tar that is made on the shores of Lake Champlain is used on the small vessels that ply upon its surface, or is sent to Quebec. A few of the poorer inhabitants in the maritime part of New Jersey live by this resource, and the product of their industry is sent to Philadelphia, where it is less esteemed than the tar of the Southern States. What is required for the few vessels that are annually launched on the Ohio, is obtained at an exorbitant price from the Alleghany Mountains, and from the borders of Tar Creek, which empties into the Ohio twenty miles below Pittsburg. The essence of turpentine used in the Western country in painting is brought from Philadelphia and Baltimore.

Such is the sum of my information concerning Pitch Pine. I have already remarked that on dry gravelly soils its wood is knotty, and, on moist lands, of so poor a quality as to be unfit for works that require strength and durability. Several other species are preferable to this, such as the Yellow and Red Pines, which grow in the same soils, and are sometimes associated with it in the forests.

PLATE CXLIII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

[This tree is of extreme value, and may be cultivated with facility, and transplanted without any difficulty. Emerson recommends that sandy soils be sown with the seeds of the Pitch Pine along with the sweet fern (*Comptonia*) or the broom, (*Genista scoparia*,) to protect the young trees, and cover the surface sown with branches from the nearest Pine forest: not being injured by salt water, there are enormous tracts near the sea-shores of America that may be rendered profitable by this process, furnishing fine fuel for steam-engines, and tar and lamp-black; perhaps also ship-timber may be grown on land now utterly valueless.

It is free from the stiffness of other Pines, and sometimes attains the height of one hundred feet and four or five feet in diameter. The trunk in dense woods is erect; in more open situations, it is often tortuous or angled. When self-planted, on the poorest land it increases at the rate of an inch in diameter in three or four years for the first twenty-five years, and after that at the rate of one in five or six. It differs from other trees of this family, its stump throwing up sprouts the spring after the stem has been felled; but these do not attain any considerable height. The fallen trunk throws out sprouts in the succeeding summer; and the bundles of leaves of both are remarkable for issuing from the axil of a single leaf, in the same manner as in the young plant. The tree is found from the Penobscot River in Maine to the mountains of Carolina.]



P. J. Rolando del.

Pinus l.

Loblolly Pine.
Pinus taeda.

LOBLOLLY PINE.

PINUS TEDA. *P. arbor maxima, supernè patula; foliis ternis, prælongis; amentis masculis divergentibus; strobilis 4-uncialibus; tessulis mucrone sursum rigide uncinato; fructiferis sub-rhomboidcis.*

THROUGHOUT the lower part of the Southern States this species is called *Loblolly Pine*, and sometimes *White Pine* about Petersburg and Richmond, in Virginia. I observed it for the first time near Fredericksburg, 230 miles south of Philadelphia, and I believe it does not exist much farther north; it certainly is not found in Pennsylvania, as Sir A. B. Lambert erroneously asserts after Vanghenheim.

In the lower part of Virginia, and in the districts of North Carolina situated northeast of the river Cape Fear, over an extent of nearly 200 miles, it grows wherever the soil is dry and sandy; on spots consisting of red clay mingled with gravel, it is supplanted by the Yellow Pine and by different species of Oak; the two Pines are regularly alternated according to the variations in the soil, and frequently vanish and reappear at intervals of four or five miles.

In the same parts of Virginia, this species exclusively occupies lands that have been exhausted by cultivation, and, amid forests of Oak, tracts of 100 or 200 acres are not unfrequently seen covered with thriving young Pines. In the more southern States it is the most common species after the Long-leaved Pine, but grows only in the branch-swamps, or long narrow marshes that intersect the pine-barrens, and near the creeks and rivers, where the soil is of middling fertility and susceptible of improvement: such is the vicinity of Charleston, S.C., which is covered to the distance of five or six miles with Loblolly Pines.

The leaves are fine, of a light green, six inches long, and

united to the number of three and sometimes of four on young and vigorous stocks. The bloom takes place in the beginning of April; the aments are nearly an inch long, and are bent and intermingled like those of the Long-leaved Pine. The cones are about four inches in length, and armed with strong spines; while closed, they have the form of an elongated pyramid, and when open, of a rhombus more or less perfect: the seeds are cast the first year.

The tree exceeds eighty feet in height, with a diameter of two or three feet and a wide-spreading summit. The tallest stocks in proportion to their diameter, I observed near Richmond, on a light, arid soil: from several of them, cylinders might have been formed, twelve or fifteen inches in diameter and fifty feet in length, perfectly regular and free from knots.

This wood has a still greater proportion of sap than that of the Pond and Pitch Pines: in trunks three feet in diameter I have constantly found thirty inches of alburnum; and in those of a foot in diameter and thirty or thirty-five feet in height, not more than an inch of heart. The concentric circles are widely distant, as might be supposed from the rapidity of its growth in the more southern States; in Virginia, where it vegetates more slowly, its texture is closer, and the proportion of sap less considerable, as I have particularly observed at the saw-mills of Petersburg.

Three-fourths of the houses in this part of Virginia are built of the Loblolly Pine, which is even used in the absence of the Yellow Pine for the ground-floors; but the boards, though only four inches wide, and strongly nailed, shrink, and become uneven. This inconvenience is attributable to its spongy consistence, and is not experienced in the Long-leaved Pine, whose concentric circles are twelve times as numerous in the same space:

In the ports of the Southern States this species is used, like the Pitch Pine in those of the North, for the pumps of ships;

at Charleston, the wharves are built with logs of the Loblolly Pine, consolidated with earth; bakers consume it in their ovens, and it is sold a third cheaper than the more resinous wood of the Long-leaved Pine.

This species is applied only to secondary uses: it decays rapidly when exposed to the air, and is regarded as one of the least valuable of the Pines. It speedily possesses itself of deserted lands, and renders a long labor necessary to clear them anew for cultivation. Though little esteemed in America, it would be an important acquisition to the South of Europe, where a tree of fine appearance and rapid vegetation is an invaluable treasure. It might be employed in joinery for objects concealed from sight, for packing-cases, &c. It remains to be proved whether it would not grow more rapidly than the Maritime Pine on the plains of Bordeaux. It supports a more northern climate, and even fructifies at Paris, but probably does not attain its perfect development.

It affords turpentine in abundance, but in a less fluid state than that of the Long-leaved Pine: as it contains more alburnum, from which the turpentine distils, perhaps by making deeper incisions it would yield a greater product.

The figure of this species in Sir A. B. Lambert's work is correct; but he mistakes it in describing it as of little stature:—*arbor humilis*, &c.; it is, on the contrary, next to the White Pine, the tallest tree of its genus in the United States.

PLATE CXLIV.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

WHITE PINE.

PINUS STROBUS. *P. arbor exœlsa ; cortice lævi, cinereo atate ; foliis quinis, gracilibus, vaginis nullis ; amentis masculis parvis, rufis ; strobilis lævigatis pendulis longo-cylindraccis.*

THIS species, one of the most interesting of the American Pines, is known in Canada and the United States by the name of *White Pine*, from the perfect whiteness of its wood when freshly exposed, and in New Hampshire and Maine, by the secondary denominations of *Pumpkin Pine*, *Apple Pine*, and *Sapling Pine*, which are derived from certain accidental peculiarities.

The leaves of the White Pine are five-fold, four inches long, numerous, slender, and of a bluish green: to the lightness and delicacy of the foliage is owing the elegant appearance of the young trees. The male aments are four or five lines long, united to the number of five or six, and arranged like those of the Loblolly and Long-leaved Pines: they turn reddish before they are cast. The cones are four or five inches long, ten lines in diameter in the middle, pedunculated, pendulous, somewhat arched, and composed of thin, smooth scales, rounded at the base. They open about the first of October to release the seeds, of which a part are left adhering to the turpentine that exudes from the scales.

This tree is diffused, though not uniformly, over a vast extent of country: it is incapable of supporting intense cold, and still less extreme heat. My father, in returning from Hudson's Bay, after traversing three hundred miles without perceiving a vestige of it, first observed it about forty leagues from the mouth of the Mistassin, which discharges itself into Lake St. John in Canada, in the latitude of 48° 50'. Two degrees farther south he found



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White Pine.
Pinus Strobus.

it common, which was doubtless owing rather to a difference of soil than of climate. From his observations and my own, it appears to be most abundant between the 43d and 47th degrees of latitude; farther south it is found in the valleys and on the declivities of the Alleghanies to their termination, but at a distance from the mountains on either side its growth is forbidden by the warmth of the climate. It is said, with great probability, to be multiplied near the source of the Mississippi, which is in the same latitude with the district of Maine, the upper part of New Hampshire, the State of Vermont, and the commencement of the St. Lawrence, where it attains its greatest dimensions. In these countries I have seen it in very different situations, and it seems to accommodate itself to all varieties of soil, except such as consist wholly of sand and such as are almost constantly submerged. But I have seen the largest stocks in the bottom of soft, friable, and fertile valleys, on the banks of rivers composed of deep, cool, black sand, and in swamps filled with the White Cedar and covered with a thick and constantly humid carpet of *sphagnum*. Near Norridgewock, on the river Kennebeck, in one of these swamps, which is accessible only in midsummer, I measured two trunks felled for canoes, of which one was 154 feet long and fifty-four inches in diameter, and the other 142 feet long and forty-four inches in diameter, at three feet from the ground. Mention is made, in Belknap's "History of New Hampshire," of a White Pine felled near the river Merrimack, seven feet eight inches in diameter; and near Hallowell I saw a stump exceeding six feet; these enormous stocks had probably reached the greatest height attained by the species, which is about 180 feet: I have been assured, by persons worthy of belief, that in a few instances they had felled individual trees of nearly this stature. Hence we must conclude that the authors who have stated its height at 260 feet have been misled by incorrect reports.

But this ancient and majestic inhabitant of the North American

forests is still the loftiest and most valuable of their productions, and its summit is seen at an immense distance aspiring toward heaven, far above the heads of the surrounding trees. The trunk is simple for two-thirds or three-fourths of its height, and the limbs are short and verticillate, or disposed in stages one above another to the top of the tree, which is formed by three or four upright branches, seemingly detached and unsupported. In forests composed of the Sugar Maple, the Beeches, or the Oaks, where the soil is strong and proper for the culture of corn, as, for example, on the shores of Lake Champlain, it is arrested at a lower height, and diffused into a spacious summit; but it is still taller and more vigorous than the neighboring trees.

In the district of Maine and the province of Nova Scotia, I have constantly remarked that the White Pine is the foremost tree in taking possession of barren, deserted lands, and the most hardy in resisting the impetuous gales from the ocean.

On young stocks not exceeding forty feet in height, the bark of the trunk and branches is smooth and even polished; as the tree advances in age it splits and becomes rugged and gray, but does not fall off in scales like that of the other Pines. The White Pine is also distinguished by the sensible diminution of its trunk from the base to the summit, in consequence of which it is more difficult to procure sticks of great length and uniform diameter; this disadvantage, however, is compensated by its bulk and by the small proportion of its alburnum; a trunk of one foot in diameter contains eleven inches of perfect wood.

The wood of this species is employed in greater quantities and far more diversified uses than that of any other American Pine: yet it is not without essential defects; it has little strength, gives a feeble hold to nails, and sometimes swells by the humidity of the atmosphere. These properties are compensated, however, by others which give it a decided superiority; it is soft, light, free from knots, and easily wrought; is more durable, and less liable to split when exposed to the sun; furnishes boards

of a great width, and timber of large dimensions: in fine, it is still abundant and cheap.

I have constantly observed the influence of soil to be greater upon resinous than upon leafy trees. The qualities of the White Pine, in particular, are strikingly affected by it. In loose, deep, humid soils, it unites in the highest degree all the valuable properties by which it is characterized, especially lightness and fineness of texture, so that it may be smoothly cut in every direction; and hence, perhaps, is derived the name of *Pumpkin Pine*. On dry, elevated lands, its wood is firmer and more resinous, with a coarser grain and more distant concentric circles; and it is then called *Sapling Pine*.

Throughout the Northern States, except in the larger capitals, seven-tenths of the houses are of wood, of which three-quarters, estimated at about 500,000, are almost wholly of White Pine: even the suburbs of the cities are built of wood. The principal beams of churches and the other large edifices are of White Pine.

The ornamental work of outer doors, the cornices and friezes of apartments, and the mouldings of fireplaces, which in America are elegantly wrought, are of this wood. It receives gilding well, and is therefore selected for looking-glass and picture-frames. Sculptors employ it exclusively for the images that adorn the bows of vessels, for which they prefer the variety called *Pumpkin Pine*.

At Boston, and in other towns of the Northern States, the inside of mahogany furniture and of trunks, the bottom of windsor chairs of an inferior quality, water-pails, a great part of the boxes used for packing goods, the shelves of shops, and an endless variety of other objects, are made of White Pine.

In the district of Maine, it is employed for barrels to contain salted fish, especially the variety called *Sapling Pine*, which is of a stronger consistence. For the magnificent wooden bridges over the Schuylkill at Philadelphia, and the Delaware at Trenton, and for those which unite Cambridge and Charlestown with

Boston, of which the first is 1500 and the second 3000 feet in length, the White Pine has been chosen for its durability. It serves exclusively for the masts of the numerous vessels constructed in the Northern and Middle States, and for this purpose it would be difficult to replace it in North America. Before the war of Independence, England is said to have furnished herself with masts from the United States; and she still completes from America the demand which cannot be fully supplied from the North of Europe. The finest timber of this species is brought from Maine, and particularly from the river Kennebeck.

Soon after the establishment of the colonies, England became sensible of the value of this resource, and solicitous for its preservation. In 1711 and 1721, severe ordinances were enacted, prohibiting the cutting of any trees proper for masts on the possessions of the crown. The order comprised the vast countries bounded on the south by New Jersey and on the north by the upper limit of Nova Scotia. I am unable to say with what degree of rigor it was enforced before the American Revolution; but for a space of six hundred miles, from Philadelphia to a distance beyond Boston, I did not observe a single stock of the White Pine large enough for the mast of a vessel of six hundred tons.

The principal superiority of the White Pine masts over those brought from Riga is their lightness; but they have less strength, and are said to decay more rapidly between-decks and at the point of intersection of the yards; this renders the Long-leaved Pine superior to the White Pine in the opinion of the greater part of American ship-builders. But some of them are of opinion that the White Pine would be equally durable if the end was carefully protected from the weather. With this view, an experiment has been imagined of a hole several feet deep made in the top of the mast, filled with oil, and hermetically sealed: the oil is said to be absorbed in a few months. The bowsprits and yards of ships of war are of this species.

The wood is not resinous enough to furnish turpentine for commerce, nor would the labor of extracting it be easy, since the White Pine occupies exclusively tracts of only a few hundred acres, and is usually mingled in different proportions with the leafy trees.

The vast consumption of this tree for domestic use, and for exportation to the West Indies and to Europe, renders it necessary every year to penetrate farther into the country; and inroads are already made, in quest of this species only, upon forests which probably will not be cleared for cultivation in twenty-five or thirty years.

The persons engaged in this branch of industry are in general emigrants from New Hampshire, led by inconstancy of character or by the desire of amassing rapidly the means of purchasing a hundred acres of land* for the establishment of their families. In the summer they unite in small companies, and traverse these vast solitudes in every direction to ascertain the places in which the Pines abound. After cutting the grass and converting it into hay for the nourishment of the cattle to be employed in their labor, they return home. In the beginning of winter they enter the forests again, establish themselves in huts covered with the bark of the Canoe Birch or the *Arbor-Vitæ*; and, though the cold is so intense that the mercury sometimes remains for several weeks from forty to forty-five degrees of Fahrenheit below the point of congelation, they persevere with unabated courage in their work. When the trees are felled, they cut them into logs from fourteen to eighteen feet long, and by means of their cattle, which they employ with great dexterity, drag them to the river, and, after stamping on them a mark of property, roll them upon its frozen bosom. At the breaking up of the ice in the spring, they float down with the

* The price of land in the county of Kennebeck, in 1807, was five or six dollars an acre.

current. All the logs that come down the Kennebeck are stopped at Winslow, about one hundred and twenty miles from the sea, where each person selects his own, and forms them into rafts with the intention of selling them to the proprietors of the numerous saw-mills between that place and the sea, or of having them sawn for his own benefit at the price of a half or even of three-quarters of the product in abundant years.

When I was at Winslow, in August, 1806, the river was still covered with thousands of logs, of which the diameter of the greater part was fifteen or sixteen inches, and that of the remainder (perhaps one-fiftieth of the whole) twenty inches. The Blue Ash and the Red Pine were the only species mingled with them, and these not in the proportion of one to a hundred. The logs which are not sawn the first year are attacked by large worms, which form in every direction holes about two lines in diameter; but if stripped of the bark they remain uninjured for thirty years: the same remark is applicable to the stumps, which resist the influences of heat and moisture during a great length of time; and it has passed into a proverb, that the man who cuts down a Pine never lives to see it decay. In Hallowell, near the Kennebeck, I saw several stumps unchanged after an exposure of forty years. Next to the district of Maine, which furnishes three-quarters of the White Pine exported from the United States, including what comes from New Hampshire by the Merrimack and is brought to Boston, the shores of Lake Champlain appeared to be the most abundantly peopled with this species, and to be not unfavorably situated for its transportation. All that is cut beyond Ticonderoga, comprising about three-fourths of the length of the lake, which is one hundred and sixty miles from north to south, is carried to Quebec, two hundred and seventy miles distant, by the Sorel and the St. Lawrence. What is furnished by the southern part of the lake is sawn at Skeensborough, transported seventy miles in the winter on sledges to Albany, and, with all the lumber of

the North River, brought down in the spring to New York in sloops of eighty or one hundred tons, to be afterwards exported in great part to Europe, the West Indies, and the Southern States.

By an extract from the custom-house register of Fort St. John, the quantity of this wood that passed down the Sorel for Quebec, between the 1st of May, 1807, and the 30th of July following, was 132,720 cubic feet of square timber, 160,000 feet of common boards, 67,000 feet of planks two inches thick, twenty masts, and 4545 logs of the same dimensions as are brought from the district of Maine.

The upper part of Pennsylvania, near the source of the Delaware and Susquehanna, which is mountainous and cold, possesses large forests of this Pine, and in the spring the timber floats down these streams for the internal consumption of the State. It enters into the construction of houses both in the country and in the towns, and is sawn into planks for exportation from Philadelphia to the West Indies. The masts of vessels built at Philadelphia are also obtained from the Delaware.

Beyond the mountains, near the springs of the river Alleghany, from 150 to 180 miles from its junction with the Ohio, is cut all the White Pine destined for the market of New Orleans, which is 2900 miles distant. In the spring, immense quantities descend the river for the consumption of the country. Three-quarters of the houses of Wheeling, Marietta, and Pittsburgh, and of Washington, in Kentucky, are built with White Pine boards.

Boston is the principal emporium of this commerce in the Northern States. The White Pine is found there in the following forms:—In square pieces from twelve to twenty-five feet long, and of different diameters; in *scantling*, or square pieces six inches in diameter, for the lighter part of frames; and in boards, which are divided into *merchantable* or *common*, and into

clear or *picked** boards. The merchantable boards are three-fourths of an inch thick, from ten to fifteen inches wide, from ten to fifteen feet long, and frequently deformed with knots: at New York, they are called Albany boards, and are sold at the same price as at Boston. The clear boards, formed from the largest stocks of the Pumpkin Pines, are of the same length and thickness as the first, and twenty, twenty-four, and thirty inches wide. They should be perfectly *clear*; but they are admitted if they have only two knots small enough to be covered with the thumb: they are employed for all light and delicate works of joinery, particularly for the panels of doors and the mouldings of apartments: at Philadelphia, they are called *White Pine panels*.

This wood is also formed into *clapboards* and *shingles*. The clapboards are of an indeterminate length, six inches wide, three lines thick at one edge, and thinner at the other: they form the exterior covering of houses, and are placed horizontally, lapping one upon another, so that the thinner edge is covered. The shingles are commonly eighteen inches long, from three to six inches wide, three lines thick at one end, and one line at the other: they should be free from knots, and made only of the perfect wood. They are packed in square bundles, and sustained by two cross-pieces of wood confined by withes. The bundles sometimes consist of five hundred, but oftener of two hundred and fifty shingles: the price at Hallowell, in 1807, was three dollars a thousand: two men can make sixteen or eighteen hundred in a day.

East of the river Hudson, the houses are almost invariably covered with these shingles, which last only twelve or fifteen years. They are exported in great quantities to the West Indies, and in the French islands they are called *essentes blanches*.

From these details an estimate may be formed of the con-

* Called also *panel* boards.

sumption of the White Pine in the United States: that of Europe and the West Indies is also considerable. In a table of importation from the United States, presented to the Parliament of Great Britain, the timber introduced in 1807 is reckoned at \$1,302,980, of which I suppose the White Pine to have formed a fifth. In 1808, it was sold at Liverpool at about sixty cents the cubic foot. Planks two inches thick and twelve wide were worth four cents a foot, and common planks six cents.

In this statement the wood imported from New Brunswick is not included, nor the vast quantities sent from the United States to the West India Islands not dependent upon Great Britain.

The precious qualities and varied uses of this tree are sufficient motives for propagating it in Europe. It flourishes in the centre of France; but it would succeed better on the borders of the Rhine, in the valleys of the Alps and Pyrenees, and in the cold and humid climates of Germany, Poland, and Russia. Its vegetation appeared to me more vigorous in Belgium than in the neighborhood of Paris. When the forests of Wild Pine and of Norway Spruce Fir are renewed in those countries, the White Pine should be introduced: it will be easy to decide whether it can be successfully naturalized.

PLATE CXLV.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

[In England this tree is called the Weymouth Pine,—a name which is gradually becoming common in America. Dr. Dwight says that formerly they were seen in the forest two hundred and fifty feet in height; and fifty or sixty years since, one was cut down in Lancaster, New Hampshire, which measured two hundred and twenty-three feet. Where it has been cultivated

in England and France, it has been found to increase in height at the rate of from fifteen inches to three feet each year, for fifty or sixty years. Emerson says that, in 1846, the exportation from the growth of Massachusetts had almost ceased, and from New Hampshire and the southern parts of Maine it had much diminished, and the lumber had become of an inferior quality. From the Penobscot, and other great rivers of the northern parts of the latter State, the exportation is still large; but the lumberers have to go every year to a greater distance from the great watercourses, and to ascend smaller streams and more remote lakes. The same is occurring in New York; and the day is evidently not far distant when New England even will have to depend on Canada for this wood, unless measures are taken to restore the Pine forests on the great tracts fitted for no other use.

It is not uncommon to see old Pines standing, deformed by the loss of the leading shoot,—a loss which old trees never recover, though nature makes an effort to throw up an erect stem from one of the horizontal limbs, distant from the centre. It is liable to lose its limbs and be injured in appearance by the weight of snow lodged on its branches. For ornamental planting the Bhotan Pine, *Pinus excelsa*, is a more beautiful tree than the White Pine, from its thicker habit of growth and more numerous and compact tufts of leaves.]

[See Nuttall's Supplement, vol. ii. p. 176.]



del.

G. Engel

Norway Spruce Fir.
Abies picea.

NORWAY SPRUCE FIR.

ABIES PICEA. *A. arbor excelsa; foliis solitariis, subtetragonis, subulatis, strobilis cylindraceis, pendulis; squamis rhombeis, planis; margine repandis, erosis.*

THE Norway Spruce Fir, like the Wild Pine, is indigenous to the northern climates of Europe and Asia, and becomes rare in descending toward the south. In France, Italy, and Spain, it abounds only among the mountains, in deep valleys, and on declivities exposed to the north.

This is one of the tallest trees of the Old Continent: it is straight-bodied, from one hundred and twenty to one hundred and fifty feet in height, and from three to five feet in diameter, and is a hundred years in acquiring its growth. Its dark foliage gives it a funereal aspect, which is rendered more gloomy by the declining of its branches toward the earth. The limbs, as in the American Spruces, are verticillate, and spring from a common centre. The leaves are longer but less numerous than those of the American species, and are slightly arched, firm, and acute. The flowers form red aments at the extremity of the upper branches, and are succeeded by reddish, cylindrical cones, five or six inches long and fifteen or eighteen lines in diameter, containing small winged seeds, which are ripe toward the end of November.

The wood is essentially different from that of the Wild Pine, being whiter, far less impregnated with resin and consequently lighter, to which is added greater elasticity. The union of these qualities renders it peculiarly proper for the yards of large ships. Besides this important use, it is much employed in England in joinery, and is called, among workmen, *White Deal*. It is brought principally from Norway, and forms a large pro-

portion of the commerce of that country in wood, which exceeds a million and a half of dollars annually. In the North of Europe its bark is frequently substituted for that of the Oak in tanning. A resinous substance, less fluid than that of the Pines, distils between the bark and the trunk, which is mixed with lampblack and used by shoemakers.

The Norway Spruce Fir is attacked, like the Wild Pine, by the insect *Bostrichus piniperda*, which makes such havoc of the resinous trees.

The extensive use of this wood in Germany has caused great attention to be paid to the forming and preserving of forests. The plantation is begun by thoroughly loosening the ground in the month of March, and the seed is mixed, in the proportion of one-sixth, with oats.

The wood of the Norway Spruce is not superior to that of the Black Spruce; but in my opinion the European species would be preferable for the northern parts of America.

Observation. A variety of this species is said to exist, called *Long Cornish Fir*, of which the cones are much larger.

PLATE CXLVI.

A branch with a cone of the natural size. Fig. 1. A seed.

[As an ornamental evergreen, this tree is unsurpassed. See Nuttall's Supplement, vol. ii., for a number of new species.

No tree is better adapted than the Norway Fir for planting in narrow strips for shelter or seclusion. The tree bears the shears; and, as it is of rapid growth, it makes excellent hedges for shelter in nursery-gardens. Such are not unfrequent in Switzerland, and in Bavaria and Baden. In 1814, there were fir-hedges in the neighborhood of Moscow between thirty and forty feet high. The whole hedge may be cut down to five feet, and afterward trimmed into ornamental shapes: every portion

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Revised ed.

Black (double) Spruce
Abies nigra.

Collected by J. H. Sargent

will thus become beautiful and green; the annual growths are then very short, giving the surface of the hedge a fine, healthy appearance. In the great prairie-country of America this beautiful tree should be employed for shelter; without some protection from trees, the prairies will never develop their full resources.]

BLACK OR DOUBLE SPRUCE.

ABIES NIGRA. *A. arbor maxima; foliis solitariis undique circa ramos erectis, brevioribus, subtragonis; strobilis ovatis, pendulis; squamis subundulatis, apice crenulatis aut divisis.*

THIS tree, which appertains to the coldest regions of North America, is called *Epinette noire* and *Epinette à la bière* in Canada, *Double Spruce* in the district of Maine, and *Black Spruce* in Nova Scotia, though the two last denominations are known throughout all these countries. I have preferred that of *Black Spruce*, which expresses a striking character of the tree and is contrasted with that of the following species, the *White Spruce*. From the influence of the soil upon the wood, it is sometimes called *Red Spruce*; and this variety has been considered, erroneously, as I prove in the sequel, as a distinct species.

The *Black Spruce* is most abundant in the countries lying between the 44th and 53d degrees of latitude, and between the 55th and 75th degrees of longitude,—viz.: Lower Canada, Newfoundland, New Brunswick, Nova Scotia, the district of Maine, Vermont, and the upper part of New Hampshire; and it is so multiplied as often to constitute a third part of the forests by which they are uninterruptedly covered. Farther south it is

rarely seen except in cold and humid situations on the top of the Alleghanies. It is particularly remarked in a large swamp not far from Wilkesbarre, in Pennsylvania, and on the Black Mountain, in South Carolina, which is one of the loftiest summits of the Southern States, and is probably thus named from the melancholy aspect occasioned by the dusky foliage of this tree. It is sometimes met with also in the White Cedar swamps near Philadelphia and New York; but in these places, which are always miry and sometimes submerged, its vegetation is feeble. The leaves are of a dark, gloomy green, about four lines long, firm, numerous, and attached singly over the surface of the branches. The flowers appear at the extremity of the highest twigs, and are succeeded by small, reddish, oval cones, pointing toward the earth, and varying in length from eight lines to two inches. They are composed of thin scales, slightly notched at the base, and sometimes split for half their length on the most vigorous trees, on which the cones are also the largest: they are not ripe till the end of autumn, when they are open for the escape of the seeds, which are small, light, and surmounted by a wing, by means of which they are wafted abroad by the wind.

The regions in which the Black Spruce is the most abundant are often diversified with hills, and the finest forests are found in valleys where the soil is black, humid, deep, and covered with a thick bed of moss: though crowded so as to leave an interval of only three, four, or five feet, these stocks attain their fullest development, which is seventy or eighty feet in height and from fifteen to twenty inches in diameter. The summit is a regular pyramid, and has a beautiful appearance on insulated trees. This agreeable form is owing to the spreading of the branches in a horizontal instead of a declining direction like those of the true Norway Pine, which is a more gloomy tree.

The trunk, unlike that of the Pines, is smooth, and is remarkable for its perpendicular ascension and for its regular diminu-

tion from the base to the summit, which is terminated by an annual shoot twelve or fifteen inches long. It is found in the same countries on the declivities of mountains, where the soil is stony, dry, and covered only with a thin bed of moss; but, as this soil is less favorable, its growth is less luxuriant and its stature less commanding. The same observation is applicable to other tracts, designated by the name of *poor black lands*, which are meagre spots covered with the Black Spruce. In these situations it has shorter, thicker leaves, of a still darker color, with cones only half as large, but similar in form, and ripe at the same period.

I shall frequently have occasion to observe that the inhabitants of the country, and mechanics who work in wood, take notice only of certain striking appearances in forest trees, such as the quality of the wood, its color, and that of the bark; and that, from ignorance of botanical characters, they give different names to the same tree, according to certain variations in these respects arising from local circumstances. To this cause must be attributed the popular distinction of Black and Red Spruce. Sir A. B. Lambert, misled by the remarkable size of the cones of the last variety which have been sent to England, and by incorrect information, determined, with some hesitation, to describe and figure it under the name of *Abies rubra*: he represents it as inferior in every respect to the Black Spruce, though, according to my own observations in the country where it grows, it unites in the highest degree all the good qualities which characterize the species. Samples of the heart would probably have confirmed his opinion that they are distinct species; for that of the Black Spruce is white, and that of the other variety reddish. But I repeat, that this difference in the wood of trees of the same species is produced only by the influence of soil.

The distinguishing properties of the Black Spruce are strength, lightness, and elasticity. Josselyn, in his "History of New England," published in London in 1672, informs us that

it was considered at that period as furnishing the best yards and topmasts in the world. Besides possessing these qualities, as we have already observed, in a higher degree, the Red Spruce is superior in size to the other variety, which grows in a poorer soil, and is less supple and more liable to be crooked.

In the dock-yards of the United States, the spars are usually of Black Spruce from the district of Maine, and for the same purpose it is exported in great quantities from Maine, New Brunswick, and Nova Scotia, to the West Indies and to Liverpool.

• Oddy says that in England it is preferred to the Norway Pine, *Abies picea*, but that it does not afford pieces of sufficient dimensions for the yards of men-of-war, which are made of the Norway Pine or of the White Pine.

The knees of vessels are frequently of Black Spruce, in the district of Maine, and sometimes at Boston, where the Oak is becoming rare. When these pieces are of Oak, they are formed of two limbs united at the base; but when of Spruce, they are made from the base of the trunk and one of the principal roots. From its strength and durability, this species is the most proper substitute for the Oak and the Larch, which is also rare in the northern parts of the United States. In Maine and at Boston it is often employed for the rafters of houses, and is more esteemed than the Hemlock Spruce, which was formerly preferred. Some persons select it for floors; it is tougher than the White Pine, but more liable to crack.

In all these regions, and particularly in Maine and New Brunswick, the Black Spruce is sawed into boards of considerable width, which are sold a fourth cheaper than those of White Pine. They are exported to the West Indies and to England; and I have been informed that a large part of them are consumed at Manchester and Birmingham in packing goods. The supply, I doubt not, will long be abundant, for the species is a hundred times more multiplied than the White Pine. In Nova

Scotia, the Red Spruce, which is straight-grained and more easily wrought, is employed for barrels to contain salted fish. This species is not resinous enough to afford turpentine as an article of commerce. The wood is filled with air, and snaps, in burning, like Chestnut.

With the young branches, especially those of the Black Spruce, is made the salutary drink known by the name of spruce beer, which in long voyages is found an efficacious preventive of the scurvy. The twigs are boiled in water, a certain quantity of molasses or maple sugar is added, and the mixture is left to ferment. The essence of spruce is obtained by evaporating, to the consistence of an extract, water in which the summits of the young branches have been boiled. As I have never seen the operation performed, I cannot describe its details; but I have often witnessed the process of making the beer in the country about Halifax and in Maine, and can affirm with confidence that it is not, as Sir A. B. Lambert asserts, the White Spruce which is used for this purpose.

If the wood of this species has in fact been proved in England to be superior to that of the Norway Pine, it would be useful to propagate it on the Old Continent; but in my opinion it would flourish only in the coldest and most humid countries of the North of Europe, and on some parts of the Alps, the Pyrenees, and the Highlands of Scotland.

PLATE CXLVII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A leaf.

WHITE OR SINGLE SPRUCE.

ABIES ALBA. *A. arbor* 45-50 *pedalis*; *foliis subglaucis undique circa ramos erectis, tetragonis*; *strobilis oblongo-cylindraccis, pendulis, luxis*; *squamis margine integerrimis.*

THIS species is indigenous to the same countries as the preceding. In Canada it is called *Epinette blanche*, in Nova Scotia, *White Spruce*, and in New Brunswick and the district of Maine, *Single Spruce*. As the two last denominations are generally known, I have adopted that which appeared to me the best.

The White Spruce commences a few degrees farther south than the species just described. In my father's notes it is first mentioned near Lake St. John, between the 48th and 49th degrees of latitude. In the district of Maine, at least in the parts which I have visited, it is much less common than the Black Spruce; and the comparison is easily made, as they are readily distinguished, especially young and insulated stocks. Though the leaves of both encompass the branches, they are marked by several characteristic differences: those of the White Spruce are less numerous, longer, more pointed, at a more open angle with the branches, and of a pale, bluish green; whence is derived the specific name of *alba*. The cones are also peculiar, being of a lengthened oval form, about two inches in one direction and six or eight lines in the other: the dimensions vary according to the vigor of the tree, but the form is unchangeable. The scales are loose and thin, with entire edges, unlike those of the Black Spruce. The seeds, also, are rather smaller, and are ripe a month earlier.

This species grows in nearly the same situations as the preceding, but it has a more tapering trunk, and is inferior in stature, rarely exceeding fifty feet in height, and twelve or sixteen



R. m. d.

P. B. G.

White Spruce
Abies balsamea

inches in diameter at three feet from the ground. Its summit, like that of the Black Spruce, is a regular pyramid, but less branching and tufted. The bark is lighter-colored, and the difference is more striking upon the young shoots.

The wood is employed for the same uses as the other: it is, however, inferior in quality, and snaps more frequently in burning. The fibres of the roots, macerated in water, are very flexible and tough; being deprived in the operation of their pellicle, they are used in Canada to stitch together the canoes of Birch bark, the seams of which are afterward smeared with a resin, improperly called *gum*, that distils from the tree.

Sir A. B. Lambert asserts that the bark is employed in tanning: this may possibly be true in Lower Canada and Newfoundland, which I have not visited, but it is never done in Maine, New Brunswick, and Nova Scotia. The branches are not used for beer, because the leaves when bruised diffuse an unpleasant odor, which they are said to communicate to the liquid.

This species is much more common in France than the Black Spruce. It is an elegant tree while young, and, as it forms an agreeable contrast with the darker foliage of the other Spruces, it is esteemed a valuable ornament for parks and gardens.

Nurserymen in France and Germany distinguish two varieties, the White or Silver Spruce and the Blue Spruce.

PLATE CXLVIII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

HEMLOCK SPRUCE.

ABIES CANADENSIS. *A. arbor maxima ; ramis gracilibus ; ramulis novellis villosissimis ; foliis solitariis, planis, subdistichis ; strobilis terminalibus, minimis, ovatis, despicientibus.*

THE Hemlock Spruce is known only by this name throughout the United States, and by that of *Perusse* among the French inhabitants of Canada. It is natural to the coldest regions of the New World, and begins to appear about Hudson's Bay, in latitude 51°; near Lake St. John, and in the neighborhood of Quebec, it fills the forests, and in Nova Scotia, New Brunswick, the district of Maine, the State of Vermont, and the upper part of New Hampshire, where I have observed it, it forms three-quarters of the evergreen woods, of which the remainder consists of the Black Spruce. Farther south it is less common, and in the Middle and Southern States is seen only on the Alleghanies; even there it is often confined to the sides of torrents and to the most humid and gloomy exposures.

In the country east and north of Massachusetts, which, without embracing Canada, is more than 750 miles long, and about 250 miles broad, the resinous trees are constantly found at the foot of the hills, and constitute nearly half of the unbroken forests which cover these regions. Hence we may conceive how extensively this species is multiplied.

Moist grounds appear not to be, in general, the most favorable to its growth: when mingled with the Black Spruce, it predominates less as the soil is more humid; and I have often seen large stocks among the Beeches and Sugar Maples on soils proper for corn.

The Hemlock Spruce is always larger and taller than the Black Spruce; it attains the height of seventy or eighty feet,



H. & A. 1861

Hemlock Spruce.
Abies canadensis.

with a circumference of from six to nine feet and uniform for two-thirds of its length. But if the number and distance of the concentric circles afford a certain criterion of the longevity of trees and the rapidity of their vegetation, it must be nearly two centuries in acquiring such dimensions.

The leaves are six or eight lines long, flat, numerous, irregularly disposed in two ranks, and downy at their unfolding. The cones are a little longer than the leaves, oval, pendulous, and situated at the extremity of the branches. In a favorable soil, this tree has an elegant appearance while less than thirty feet high, owing to the symmetrical arrangement of its branches and to its tufted foliage; and at this age it is employed in landscape-gardening. When arrived at its full growth, the large limbs are usually broken off four or five feet from the trunk, and the dried extremities are seen staring out through the little twigs which spring around them. In this mutilated state, by which it is easily recognised, it has a disagreeable aspect, and presents, while in full vigor, an image of decrepitude. This accident, which is attributed to the snow lodging upon the close, horizontal, tufted branches, never happens to the young trees, whose fibres are more flexible. The woods are also filled with dead stocks; but I am unable to say whether their destruction is occasioned by an insect which attaches itself of preference to the Pines, or to some other cause. The dead, moss-grown trees, which stand mouldering for twenty or thirty years, deform the forests of this part of the United States, and give them a gloomy and desolate appearance.

The Hemlock Spruce is distinguished by the peculiarity of sometimes ceasing to grow at the height of twenty-four or thirty inches. In this state it has a pyramidal shape, and its compact, tufted branches adhere to the ground. It might be employed to form hedges and to decorate gardens in place of the Yew, to which it is preferable for the superior rapidity of its growth and the sprightlier tint of its foliage, while it bears the

pruning-hook with equal patience: this remark I made while observing the Spruces upon an open, dry, stony spot between Portland and York.

Unhappily, the properties of its wood are such as to give this species only a secondary importance, notwithstanding its abundant diffusion: it is the least valuable in this respect of all the large resinous trees of North America. But the regret which we should experience to see it occupying so extensively the place of more useful species is forbidden by a property of its bark inestimable to the country where it grows,—that of being applicable in tanning.

It is esteemed an excellence in wood to split in a straight line, which it does when the fibre is vertical: that of the Hemlock Spruce is so oblique that it makes the circuit of stocks fifteen or twenty inches in diameter in ascending five or six feet. Besides this defect, which is essential, and which renders it unfit for rural fence, the old trees frequently have the concentric circles separated at intervals, or, in the language of the country, are *shaky*, which greatly impairs their strength. This effect is produced by the winds, which have a powerful hold upon a large, compact summit exposed above the heads of the surrounding trees. It is found to decay rapidly when open to the atmosphere, and is therefore improper for the external covering of houses, which is another important defect in a country where nearly all the houses are of wood. But, as the White Pine becomes rarer, this species is substituted for it as extensively as possible: it is firmer, though coarser-grained, affords a tighter hold to nails, and offers more resistance to the impression of other bodies; for this reason it is employed in the district of Maine, in the form of two-inch planks, for threshing-floors. But the most common use in which great quantities of it are consumed in the Northern States is for the first sheathing of wooden houses, which are afterward covered with *clap-boards* of White Pine. For economy, the interior frame is sometimes

made of Hemlock Spruce; and it is found when guarded from humidity, to be as durable as any other species. It is always chosen for the laths of the interior walls, and is exported in this form to England. In the district of Maine, it is usually taken for the posts of rural fences, which last about fifteen years, and are preferable to those of Gray and Red Oak. It contains little resin; and I have found the trunk but slightly coated with turpentine where large pieces of bark had been removed long before.

I have already observed that this bark is a substitute for that of the Oaks in the preparation of leather. It is taken from the tree in the month of June, and half the epidermis is shaved off with a plane before it is thrown into the mill. From the district of Maine it is exported to Boston, Providence, &c., and is almost exclusively employed in the *tan-yards*. It is brought to New York from the upper parts of the Hudson, and is sometimes carried to Baltimore. Its deep red color is imparted to the leather, and I have been informed by tanners that it is inferior to Oak bark, but that the two species united are better than either of them alone. Hemlock Spruce bark was once exported to England, but the commerce has ceased with the demand. The Indians are said to use it in dyeing their light baskets made of Red Maple.

This species yields seed in many gardens of France, England, and Germany; but in France its vegetation is not luxuriant, because it is usually planted in situations too open and dry. It offers no inducement to propagate it in Europe.

The figure in Sir A. B. Lambert's work is correct, but he repeatedly errs in the brief description annexed, and takes no notice of the peculiar property of the bark.

PLATE CXLIX.

A branch with a cone of the natural size. Fig. 1. A seed.

[This is one of the most beautiful trees of the family; its tufted foliage, tapering branchlets, and the smoothness of its limbs, and its small, delicate terminal cones, and the majestic gracefulness of full-grown specimens, should strongly recommend it to those who are unselfish enough to plant for posterity. The cones are mature in the autumn, and shed their seeds then and during the winter. The Hemlock is patient of the knife, and consequently makes a highly-ornamental hedge. It forms in a few years an impenetrable evergreen wall, which would be invaluable for shelter from northwest winds. I have seen hedges of this kind in America superior to any other in ornamental appearance. In the beginning of summer the delicate-green branches, surmounted with a tuft of yellowish-green recent leaves, have an effect of peculiar beauty. A hedge of Hemlock should be trimmed twice a year, in June and August, without which it will not attain its full beauty.]

AMERICAN SILVER FIR.

ABIES BALSAMIFERA. *A. arbor* 40–45 *pedalis*; *foliis solitariis, subtus argenteis, apice emarginatis integrisve, subrecurvo-patentissimis; strobilis cylindraceis, violaceis, sursum spectantibus.*

THE coldest regions of North America are the native country of this species of Spruce. In the United States, Canada, and Nova Scotia, it is called *Silver Fir*, *Fir Balsam*, and *Balm of Gilead*.

From the observations of Messrs. Titus Smith, estimable botanists who have explored Nova Scotia and with whom I became acquainted at Halifax, by those of my father who visited Canada, and by my own, the Silver Fir appears not to



Brown del.

Brown del.

American Silver Fir, or Balm of Gilead Fir.
Abies balsamifera.

constitute masses of woods, but to be disseminated, in greater or less abundance, among the Hemlock and Black Spruces. Farther south it is found only on the summit of the Alleghanies, and particularly on the loftiest mountains of North Carolina. Its height rarely exceeds forty feet, with a diameter of twelve or fifteen inches. This statement is confirmed by the persons whom I have just cited; and Vanghenheim, who never travelled in these countries, and after him Sir A. B. Lambert, mistakenly assert that it is a tree of elevated stature. The body tapers from a foot in diameter at the surface of the ground to seven or eight inches at the height of six feet. When standing alone and developing itself naturally, its branches, which are numerous and thickly garnished with leaves, diminish in length in proportion to their height, and form a pyramid of perfect regularity. The leaves are six or eight lines long, and are inserted singly on the sides and on the top of the branches; they are narrow, rigid, and flat, of a bright green above and a silvery white beneath; whence probably is derived the name of the tree.

The cones are nearly cylindrical, four or five inches long, an inch in diameter, and always directed upward; this last characteristic, which belongs also to the Silver Fir of Europe, distinguishes those species from the *Epicus*, whose cones are turned toward the earth.

The wood of the Silver Fir is light and slightly resinous, and the heart is yellowish. In Maine, where it chiefly abounds, it is not employed, on account of its deficiency of size or of strength. I was informed by Messrs. Smith, that in Nova Scotia it sometimes serves for the staves of casks used in packing fish; but for this purpose the White Pine and Yellow Spruce are commonly preferred.*

The resin of the Pines is extracted by means of incisions in the body of the tree at which it exudes from the pores of the bark and from the sap-vessels of the alburnum: in the American

and European Silver Firs, this substance is naturally deposited in vesicles on the trunk and limbs, and is collected by bursting these tumors and receiving their contents in a bottle; only a few bottles are annually obtained in Canada, the district of Maine, and the adjacent countries. It is sold in England and the United States under the name of *balm of Gilead*, though everybody knows that the true balm of Gilead is produced by the *Amyris Gileadensis*, a very different vegetable and a native of Asia: perhaps the name has been borrowed in consequence of some resemblance between the substances in taste and smell. The fresh turpentine is a greenish transparent fluid, of an acrid, penetrating taste; given inconsiderately it produces heat in the bladder, and applied to wounds it causes inflammation and acute pain. It has been highly celebrated in England, and is recommended in certain stages of the pulmonary consumption; in these cases it is preferred to the resin of the European Silver Fir, which is collected in a similar manner in Switzerland and in some parts of Germany.

This tree has been long cultivated in Europe; but it must be reserved for the embellishment of pleasure-grounds, where its regular form and agreeable foliage give it a distinguished place among evergreen trees.

The Silver Fir of Europe is so analogous to that of America, that it is unnecessary to describe it: the only difference is that it has longer leaves and bigger cones, and attains a much greater elevation: according to M. Burgsdorf, Grand-forester of Prussia, it is sometimes one hundred and fifty feet high and six feet in diameter. The wood of the two species is similar in its general character, and, though the advantage is on the side of the Silver Fir of Europe, it is still inferior to the Norway Spruce Fir, which is the more to be regretted on account of its size.

PLATE CL.

A branch with a cone of the natural size. Fig. 1. A seed.

[As an ornamental tree, the Balm of Gilead retains its beauty for only the first fifteen or twenty years of its existence, during which period, when in health and vigor, it is extremely beautiful both in color and form. After this period it loses its lower branches, has a sickly hue, and should then be dismissed from the pleasure-grounds.]

III.—10*

CYPRESSES.

THE researches of botanists have made us acquainted with only seven species of Cypress, of which two belong to the New Continent and are indigenous to the United States. Among the exotic species the Pyramidal Cypress, *Cupressus fastigiata*, deserves attention in the Southern States. This tree has been celebrated from antiquity for the excellence of its wood and the singularity of its form. From the gloomy appearance of its tufted branches, compressed about the trunk and charged with dark, impenetrable foliage, it was consecrated to funeral solemnities and planted about temples and tombs.

"The Pyramidal Cypress, originally from Crete, is thirty or forty feet in height, smooth, and free from the defect observed in the Virginian Cedar, of cracking at the insertion of the limbs. The wood is hard, odoriferous, of a uniform texture and a brilliant red complexion. Pliny affirms that it is very durable, and that its color is unchangeable:—*Cariem vetustatemque non sentit Cupressus . . . Materie nitor maxime valet æternus*. PLIN: lib. xvi. cap. 40. Formerly the rarest and most precious objects were preserved in boxes of Cypress; and we are informed that the doors of St. Peter's at Rome, which had lasted 1200 years, from Constantine to Eugene IV., were of this wood. It is also employed for tables, musical instruments, and the tubes of organs. The fruit, which is known by the name of *Cypress nut*, is employed in medicine as an astringent; and Pliny assures us that the leaves pounded and mingled with seeds preserve them from worms.

"The Cypress is multiplied from the seed, which is the best



Bacca del

Cypress.
Cupressus disticha.

method; by layers and by slips. In the beginning of spring the seeds are sown and lightly covered in vessels filled with mould and sand. The young plants must be kept in the shade and protected from the frost. To obtain good seed, Duhamel says that in March and April we should select the cones which begin to open, and store them in a dry place: the seeds which fall out are the best; those which are obtained by opening the cones very rarely germinate."—*Desfontaines, Hist. des Arb. et Arbriss.*, tom. ii. p. 567.

CYPRESS.

Monœcia monadelphia. LINN. Coniferae. JUSS.

CUPRESSUS DISTICHA. *C. foliis planis, quasi pinnatim distichis, (deciduis,) floribus masculis aphyllis-racemosis; strobilis subgloboso-ovoides.*

Taxodium distichum. RICH.

THIS species is the most interesting of its genus for the varied applications of its wood and for its extraordinary dimensions in a favorable soil and climate. In Louisiana it is called *Cypre* or *Cypres*, and in the Atlantic Southern States Cypress, and sometimes Bald Cypress. The names of Black and White Cypress, in the Carolinas and Georgia, are founded only on the quality and color of the wood.

The banks of Indian River, a small stream that waters a part of Delaware, in latitude 38° 50', may be assumed as its northern boundary. Hence, in proceeding southward, it becomes constantly more abundant in the swamps; but in Maryland and Virginia it is confined to the vicinity of the sea, where the winter is milder and the summer more intense. Beyond Nor-

folk its limits coincide exactly with those of the pine-barrens, and in the Carolinas and Georgia it occupies a great part of the swamps which border the rivers after they have found their way from among the mountains and have entered the lowlands.

East Florida, which I have visited, is similar in its aspect to the maritime parts of the Southern States, except that the soil is in general more uniform; hence, the Long-leaved Pine and the Cypress are accompanied by a smaller variety of trees, and are consequently more abundant, the one on the low grounds and the other on the uplands.

The Mississippi, from its mouth to the river Arkansas, a distance, in following its windings, of more than six hundred miles, is bordered with marshes, which, at the annual overflowing of this mighty stream, form a vast expanse of waters. In Louisiana, those parts of the marshes where the Cypress grows almost alone are called *Cyprières*, Cypress swamps, and they sometimes occupy thousands of acres. As in the Floridas, the swamps are contiguous to immeasurable plains covered with Pines, or oftener with tall grass mingled with other plants. In the midst of these Pine forests and savannas is seen here and there a bog or a plash of water filled with Cypresses, whose squalid appearance, when they exceed eighteen or twenty feet in height, proves how much they are affected by the barrenness of a soil which differs from the surrounding waste only by a layer of vegetable mould a little thicker upon the quartz sand. From these particulars, a sufficiently just idea may be formed of the geographical situations and of the soil in which the Cypress is found, over an extent of more than 1500 miles, from its first appearance toward the north to the Mississippi. Toward the southwest my information does not reach beyond Louisiana, though I have some reason to believe that it is seen as far as the mouth of the River Del Norte, latitude 26°, which, if we measure the circuit of the Gulf of Mexico, makes a distance of more than 3000 miles.

M. de Humboldt, in his interesting account of New Spain, mentions several trees of this species in the ancient gardens of the Emperor of Mexico, which were planted before the arrival of the Spaniards, and are now of considerable size.

In the swamps of the Southern States and the Floridas, on whose deep, miry soil a new layer of vegetable mould is every year deposited by the floods, the Cypress attains its utmost development. The largest stocks are one hundred and twenty feet in height, and from twenty-five to forty feet in circumference above the conical base, which, at the surface of the earth, is always three or four times as large as the continued diameter of the trunk: in felling them, the negroes are obliged to raise themselves upon scaffolds five or six feet from the ground. The base is usually hollow for three-quarters of its bulk, and is less regularly shaped than that of the Large Tupelo. Its surface is longitudinally furrowed with deep channels, whose ridges serve as cramps to fix it more firmly in the loose soil. The roots of the largest stocks, particularly of such as are most exposed to inundation, are covered with conical protuberances, commonly from eighteen to twenty-four inches and sometimes four or five feet in thickness; they are always hollow, smooth on the surface, and covered with a reddish bark like the roots, which they resemble, also, in the softness of their wood; they exhibit no sign of vegetation, and I have never succeeded in obtaining shoots by wounding their surface and covering them with earth. No cause can be assigned for their existence; they are peculiar to the Cypress, and begin to appear when it is twenty or twenty-five feet in height; they are not made use of, except by the negroes for beehives. The summit of the Cypress is not pyramidal like that of the Spruces, but is widely spread and even depressed upon old trees. The foliage is open, light, and of a fresh, agreeable tint; each leaf is four or five inches long, and consists of two parallel rows of leaflets upon a common stem. The leaflets are small, fine, and somewhat arch-

ing, with the convex side outward. In the autumn they change from a light green to a dull red, and are shed soon after. Boiled during three hours in water, they afford a fine, durable cinnamon color: such, at least, has been the result of several experiments made in Europe.

The Cypress blooms in Carolina about the first of February. The male and female flowers are separately borne by the same tree, the first in flexible pendulous aments, and the second in bunches scarcely apparent. The cones are about as large as the thumb, hard, round, of an uneven surface, and stored with small, irregular, ligneous seeds, containing a cylindrical kernel: they are ripe in October, and retain their productive virtue for two years.

The wood is fine-grained, and, after being for some time exposed to the light, of a reddish color: it possesses great strength and elasticity, and is lighter and less resinous than that of the Pines. To these properties is added the faculty of long resisting the heat and moisture of the southern climate. The color of the bark and the properties of the wood vary with the nature of the soil; the stocks which grow near the natural bed of the rivers, and are half the year surrounded with water to the height of three or four feet, have a lighter-colored bark than those which stand retired in places which the waters do not reach, or where they sojourn but a moment. The wood, also, is whiter, less resinous, and less heavy. These are called *White Cypresses*. The others, of which the bark is browner and the wood heavier, more resinous, and of a duskier hue, are called *Black Cypresses*. When destined to be employed in the arts, both varieties should be felled in the winter, and kept, till by a long process, the wood has become perfectly dry. A resin of an agreeable odor and a red color exudes from the Cypress; it is not abundant enough to be collected for commerce, though more copious than that of the White Cedar, which is probably the reason of the wood being denser and stronger: the negroes

prefer it to that of the Pines as a dressing for suppurating wounds.

This wood is more generally employed in Louisiana than in any other part of the United States: it is profitably substituted for the White Oak and the Pine, which are rare; and it is proved to be twice as durable as the Pine. Nearly all the houses in New Orleans were of wood, and the frame, the interior work, and the outer covering, of Cypress. It was almost as generally employed in Georgia and the Carolinas soon after their settlement; but it is now replaced by other species, as all the large stocks have been consumed in the populous districts: near the swamps, where it abounds, the houses are still built, or at least covered, with it. Of whatever materials the building is constructed in these States, the roof is universally covered with Cypress shingles, which, if made from trees felled in the winter, last forty years. They are split off in a direction parallel to the concentric circles. At Norfolk in Virginia, near the Dismal Swamp, where immense quantities are made both of this species and of White Cedar, those of Cypress are preferred; at Philadelphia and Baltimore, where they are also procured at equal prices, the preference is given to those of White Cedar. This fact seems to support the conclusion that each unites the principles which insure durability only in the soil and climate in which they respectively abound.

In the towns of the Southern States where the White Pine is cheap, it has in a great measure taken the place of the Cypress for the interior work of houses; but Cypress boards are still preferred for the inside of brick houses, and for window-sashes, and the panels of doors exposed to the weather: cabinet-makers also choose it for the inside of mahogany furniture.

I have been assured that in Louisiana it is found highly proper for the masts and sides of vessels, and it has the same reputation in Charleston and Savannah, though at present it is little employed. Wherever it grows it is chosen for canoes,

which are fashioned from a single trunk and are thirty feet long and five feet wide, light, solid, and more durable than those of any other tree.

On the banks of the Mississippi it is used to enclose plantations, and posts made of the perfect wood last a long time in the ground. For this last it is preferred to every other tree in those districts of Georgia in which it abounds or is easily procured. It makes the best pipes to convey water under ground; especially the Black Cypress, which is more resinous and solid.

The inexhaustible Cypress-swamps on the Mississippi not only supply materials for every species of building in Lower Louisiana, but furnish for exportation to the West Indies. This branch of commerce, which consisted principally of boards and shingles, has declined within a few years, in consequence of the great exportation from the Northern States of different species of Pine, particularly the White Pine, which are sold at half the price and devoted to nearly the same uses.

At Havana, the White Pine has generally superseded the Cypress for sugar-cases, for which it was once extensively used; for the covering of houses, Cypress shingles are still preferred, and the consumption in the French, English, and Danish colonies is estimated at one hundred millions of shingles annually, of which the greater part come from Norfolk, Wilmington, and Savannah: more than fifteen millions have been brought in a single year from Norfolk, and more than thirty millions from Wilmington. They are twenty-two or forty-four inches long and from three to six inches wide: in February, 1808, the price of the longest was from four to five dollars a thousand in Philadelphia, and they usually bear a double price in the West Indies.

In Europe, the patrons of useful culture and ornamental gardening have labored zealously for more than fifty years to multiply the Cypress. Many of them are of opinion that, as it supports the winter of Paris and even of Belgium and England,

it might be profitably planted in many vacant marshes and watery ground. The warmest praise is due to the intentions with which this plan is recommended, but I cannot fully adopt the sanguine hopes that are entertained of its result: probably it will always be more advantageous to occupy these spots with the Ashes, the Willows, the Alders, the Poplars, and the Maples, which are incomparably more rapid in their growth, which sprout afresh when felled, and whose wood is as useful in Europe, where the houses are built of stone and covered with tiles or slate. I am convinced the Cypress can never be profitably cultivated above the 44th degree of latitude; it requires heat as well as humidity, and the moderate temperature of our scanty summers is insufficient to ripen the seeds of the Bald Cypresses which were planted about Paris more than forty years since, and which bloom every year. To the same cause must be attributed the slowness of their growth; the greater part of them are not more than twenty or twenty-five feet in height. The largest stocks in France are on the ancient estates of Duhamel, about sixty miles from Paris. Planted more than forty years ago, in a congenial situation, they have reached the height of forty feet, with a diameter of eleven or twelve inches; but the seeds are rarely matured. An agriculturist of excellent practical views, whose property lies partly in the plains of Bordeaux, where he has formed an establishment for the naturalization of exotic trees, has attempted the cultivation of the Cypress with the most satisfactory success.

It would be unavailing to recommend the preservation and multiplication of the Cypress in the maritime districts of the Carolinas and Georgia; though for an extent of more than 900 miles they have neither stone nor slate for building, it becomes daily more profitable for the increasing population to convert the marshes into rice-grounds, which afford a sure subsistence to the inhabitants and swell the mass of exported produce. Instead of wood, the houses will be constructed of bricks, which is already

beginning to be done, and covered with slate imported from the Northern States or from Europe. It is highly probable that in less than two centuries the Cypress will disappear from the Southern States.

PLATE CXLI.

A branch with leaves of the natural size. Fig. 1. A cone. Fig. 2. A seed. Fig. 3. A kernel. Fig. 4. The half of a seed. Fig. 5. A conical excrescence from the roots.

[*Soil, Propagation, &c.* A rich, moist soil is required to produce the deciduous Cypress of any great size, and it will not thrive in high situations. The species is increased by seeds which come up the first year. The tree may also be propagated by cuttings, put, in autumn, into sand or heath-soil, in the shade, and kept moist. Cuttings of the winter wood, or of the summer shoots with the leaves on, will root in a vessel of water in a very few weeks; and if an inch of soil be placed at the bottom of the vessel, the fibres will root in it, and the plants may be used as if they had been struck in the usual manner. Layers put down in moist soil root the first year.]

WHITE CEDAR.

CUPRESSUS THYOIDES. C. foliis squamulatin imbricatis; ramulis compressis; strobilis minutis, globulosis.

AMONG the resinous trees of the United States, the White Cedar is one of the most interesting for the varied utility of its wood. North of the river Connecticut, it is rare and little employed in the arts; in the Southern States, I have not seen



Bosc. del.

Galt. sculp.

White Cedar.
Cupressus thyoides.

it beyond the river Santee, but I have been assured that it is found, though not abundantly, near Augusta on the Savannah: it is multiplied only within these limits, and to the distance of fifty miles from the shore of the ocean.

In New York, and in New Jersey and Pennsylvania, it is known by the name of *White Cedar*, and in Maryland, Virginia, and North Carolina, by that of *Juniper*. I have adopted the first denomination, which is not unknown where the second is habitually used, because the tree belongs to a different genus from the Junipers. At Boston, and in Vermont, New Hampshire, and the more northern parts of America, the *Arbor-Vitæ* is called *White Cedar*; but I have thought proper to retain the name for the species we are considering.

The *White Cedar* grows only in wet grounds. In the maritime districts of New Jersey, Maryland, and Virginia, it nearly fills the extensive marshes which lie adjacent to the salt-meadows and are exposed in high tides to be overflowed by the sea. In New Jersey it covers almost alone the whole surface of the swamps, of which the *Tupelo* and *Red Maple* occupy the skirts. Farther south, it is mingled with the *Cypress*, by which it is at length entirely supplanted. In Lower Jersey and Maryland, the swamps are accessible only during the dryest part of the summer and when they are frozen in winter. The trees stand so thick in them that the light can hardly penetrate the foliage, and in their gloomy shade spring at every step tufts of the *Dwarf Rose Bay*, *Honeysuckle*, and *Andromeda*, whose luxuriant vegetation proves that they delight in dark and humid exposures.

The *White Cedar* is seventy or eighty feet high, and rarely more than three feet in diameter, unless, perhaps, in the great swamps which have not been thoroughly explored, such as the *Dismal Swamp* near Norfolk in Virginia, which is covered with this species and the *Cypress*. When the *White Cedars* are close and compressed, the trunk is straight, perpendicular, and

destitute of branches to the height of fifty or sixty feet: they are observed to choose the centre of the swamps, and the Cypresses the circumference.

The epidermis is very thin on the young stocks; but as they grow older it becomes thick, of a soft filaceous texture, of a reddish color, and similar to that of an old vine. When cut, a yellow transparent resin of an agreeable odor exudes, of which a few drops could hardly be collected in a summer from a tree of three feet in circumference.

The foliage is evergreen; each leaf is a little branch numerous subdivided, and composed of small, acute, imbricated scales, on the back of which a minute gland is discerned with the lens. In the angle of these ramifications grow the flowers, which are scarcely visible, and which produce very small, rugged cones of a greenish tint, which changes to bluish toward the fall, when they open to release the fine seeds.

The concentric circles are always perfectly distinct, even in stocks of considerable size; but their number and compactness prove that the tree arrives at its full growth only after a long lapse of years. I have counted two hundred and seventy-seven annual layers in a trunk twenty-one inches in diameter at five feet from the ground, and forty-seven in a plant only eight inches thick at the surface, which proved it to be already fifty years old. I was told that the swamp in which it grew had been burnt at least half a century before, and had been repopled from a few stocks that escaped the conflagration, or perhaps by the seeds of the preceding year.

The wood is light, soft, fine-grained, and easily wrought. When perfectly seasoned, and exposed for some time to the light, it is of a rosy hue. It has a strong aromatic odor, which it preserves as long as it is guarded from humidity. The perfect wood resists the succession of dryness and moisture longer than that of any other species, and for this quality principally, as well as its extreme lightness, it is preferred at Baltimore and Phila-

delphia for shingles, which are cut transversely to the concentric circles, and not parallel like those of the Cypress. They are from twenty-four to twenty-seven inches long, from four to six inches broad, and three lines thick at the larger end: in the advertisements of Baltimore they are called *Juniper shingles*. At Philadelphia and Baltimore they are generally preferred to those of Cypress, as they are larger, and are free from the defects of splitting when nailed upon the rafters. The houses in those cities, as well as in New York and the smaller circumjacent towns, are covered with them: they usually last thirty or thirty-five years. The domestic consumption is great, and the exportation to the West Indies is estimated at several millions.

The White Cedar has long since ceased to be employed for the frames of houses; stocks of sufficient dimensions are rare, and are more profitably reserved for shingles and for other works of joinery, for which this species is superior to the White Pine, being still more durable and more secure from worms. It continues to be used in building only near the great swamps in which it abounds, as about Great Egg Harbor and Indian River in New Jersey, and near the Dismal Swamp in Virginia.

The superior fitness of this wood for various household utensils has given rise, in Philadelphia, to a distinct class of mechanics, called cedar-coopers; and a great number of workmen are employed for the domestic and foreign market. They fabricate principally pails, washtubs, and churns of different forms. This ware is cheap, light, and neatly made; and instead of becoming dull, like that of other wood, it grows whiter and smoother by use. The hoops are made of young Cedars stripped of the bark and split into two parts. The saplings are appropriated exclusively to this object, and vary in price according to their length: the largest are two inches thick at the base and eleven or twelve feet long.

At the mouth of the river Cape Fear, the pilots and fishermen cover the sides of their boats with clapboards of White Cedar,

which they prefer to those of Cypress, as being lighter, more durable, and less liable to split.

I have been assured that this wood, selected with care, makes excellent sound-boards for forte-pianos. The merchants of Philadelphia find it the best for preserving oils. Charcoal highly esteemed in the manufacture of gunpowder is made of young stocks about an inch and a half in diameter, deprived of their bark; and the seasoned wood affords beautiful lampblack, lighter, and more intensely colored, though less abundant, than that obtained from the Pine.

In New Jersey, not far from Philadelphia, the farmers on the borders of the Cedar swamps employ this tree for field-fences; the rails, formed of young stocks entire or split in the middle, last from fifty to sixty years when deprived of the bark.

Swamps which produce the White Cedar are a valuable species of property, and might be rendered more profitable by more judicious management.

PLATE CLII.

A branch with a cone of the natural size. Fig. 1. A leaf. Fig. 2. A seed.

[This graceful and beautiful tree connects the Arbor-Vitæ with the Cypresses, having the characters of both:—the scale-like, imbricate leaves, and fan-shaped branches of the former, and the lofty port and globular or many-sided fruit of the latter. It should be extensively cultivated, and is attended with less expense and trouble than any other forest tree, and it conflicts with no other. Sow the seeds abundantly on cold, swampy lands, in the fall of the year, upon the surface of the ground or water, and in six to eighteen months they will vegetate. In a few years thinnings might be made, which, for enclosure alone, would pay a high rate of interest upon the value of the land and of the labor bestowed.—EMERSON.]



Costa del

Calicut comp.

American Larch
Larix americana

AMERICAN LARCH.

LARIX AMERICANA. *L. foliis brevioribus, deciduis; strobilis parvis, ovoides-subglobosis; squamis paucioribus.*

IN the North of the United States this tree is commonly designated by the name of Hackmatack; but I have preferred that of American Larch, which is not unknown where the other is habitually used. The French Canadians call it *Epinette rouge*.

The European and American Larches are more strictly confined than any other resinous trees of the northern zone of the two continents, and they are the first to disappear in approaching a milder sky. The American species is most abundant in Vermont, New Hampshire, and the district of Maine; but, though the soil is well adapted to its growth and the winter is long and severe, it does not form the hundredth part of the resinous growth, which consists principally of the Black Spruce, the Hemlock Spruce, and the Red Cedar. According to my father's observations in his journey to Hudson's Bay, it is only beyond the St. Lawrence, particularly near Lake St. John, and the Great and the Little Lake Mistassin, that it begins to abound and to form masses of woods, some of which are several miles in extent. I have been informed that it is profusely multiplied in Newfoundland, in nearly the same latitude. New Jersey, Pennsylvania, and the coldest and gloomiest exposures in the mountainous tracts of Virginia, are the limit of its appearance toward the south: but it is rare in these States, and in Lower Jersey, in the vicinity of New York, it is seen only in the swamps of White Cedar, with which it is scantily mingled. The numerous descendants of the Dutch in New Jersey call it *Tamarack*.

I have remarked that in Vermont, and the district of Maine, the Larch grows only in low and moist places, and never on uplands, as about Hudson's Bay and Newfoundland; hence we may conclude that the climate of the northern extremity of the United States is too mild for its constitution.

The American Larch, like that of Europe, is a magnificent vegetable, with a straight, slender trunk eighty or one hundred feet in height and two or three feet in diameter. Its numerous branches, except near the summit, are horizontal or declining. The bark is smooth and polished on the trunk and longer limbs, and rugged on the smaller branches. The leaves are flexible, shorter than those of the European species, and collected in bunches; they are shed in the fall and renewed in the spring. The flowers, like those of the Pines, are separate upon the same tree; the male aments, which appear before the leaves, are small, oblong, and scaly, with two yellow anthers under each scale; the female flowers are also disposed in aments, and are composed of floral leaves covering two ovaries, which in process of time become small, erect, scaly cones three or four lines long. At the base of each scale lie two minute winged seeds. On some stocks the cones are violet-colored in the spring instead of green; but this is an accidental variation, for the trees are in no other respects peculiar.

The wood of the American Larch is superior to any species of Pine or Spruce, and unites all the properties which distinguish the European species, being exceedingly strong and singularly durable. In Canada it is considered as among the most valuable timber, and has no fault except its weight. In the district of Maine it is more esteemed than any other resinous wood for the knees of vessels, and is always used for this purpose when proper pieces can be procured. Turpentine is never extracted from it in America, as is done from our native species in Europe.

The Larch is justly appreciated in the United States; but it is

little employed, because it is rare and may be replaced by several resinous trees which are cheaper and more abundant.

Sir A. B. Lambert, in his splendid work upon the Pines, describes two species of American Larch, the first of which is evidently the tree we have been considering; the second he denominates *Larix microcarpa*, and characterizes it by smaller fruit and drooping branches. My father doubtless considered it as a variety.

The cones of the European Larch are twice as large as those of the American species; but the two trees are so analogous that a separate description is unnecessary.

PLATE CLIII.

A branch with leaves and fruit of the natural size. Fig. 1. A seed.

[As an ornamental tree, the European Larch takes precedence of the American; the latter grows generally with a crooked top, and its leaves are shorter than the European, which is fit for every useful purpose in forty years' growth.

The soils suitable for Larch, according to Matthew, are sound rock, with a covering of loam; gravel not ferruginous, in which water does not stagnate, even though nearly bare of vegetable mould; firm, dry clays, and sound, brown loam; all very rough ground, particularly ravines. The most desirable situation is where the roots will neither be drowned by stagnant water in winter nor parched by drought in summer. See Loudon's "Arboretum," pp. 2353-2399.]

CEDAR OF LEBANON.

LABIX CEDRUS. *L. foliis fasciculatis, perennantibus; strobilis ovatis, obtusis, erectis; squamis adpressis, rotundatis.*

THE Cedar of Lebanon is the largest and most majestic among the resinous trees of the Old World, and one of the finest vegetable productions of the globe. Till Pallas discovered it in the North of Russia, in 1770, it was believed to be peculiar to the mountains of Lebanon, in Asia Minor.

Modern travellers, and, among others, Mr. Labillardière, who visited that part of the East in 1788, inform us that the large forests seen by Belon, in 1550, upon Mount Aman, have disappeared, and that a few of these trees only are found upon the highest ridge, where they grow immediately below the snow which caps the summit during a great part of the year. He computes their number at about one hundred, of which he observed seven of extraordinary size, and measured one that was thirty feet in circumference, with the primary limbs nine or ten inches in diameter. Standing alone, and enjoying the free access of the light and air, they were less remarkable for stature than for expansion. In massive forests they probably attain a height proportioned to their diameter; but this tree has always been remarked for the length of its limbs, as is proved by the allusion of the Hebrew poet:—"They shall spread out their branches like the Cedar."

The ancients ascribed to the wood of the Cedar a duration of many ages. The sacred historians inform us that it was chosen for the building of Solomon's Temple; it was also employed in that of Apollo at Utica.

Other proofs might be adduced in evidence of the opinion entertained by the Greeks and Hebrews of the durability of



Pinus del

Cedrus cedrus

Cedar of Lebanon.
Larix cedrus.

this wood, which they brought at a great expense from Mount Lebanon; but Professor Martyn justly observes that there is great obscurity in the passages of the ancient authors, as different species, and even different genera, were confounded under the name of Cedar. Their accounts of the Cedar of Lebanon are, in some respects, inapplicable to the tree we are considering, which is an inferior kind of deal, soft, inodorous, and of short duration.

If these remarks detract from the interest which we attach to the Cedar of Lebanon, the majestic and beautiful form of this species renders it highly deserving of our notice.

The few remaining stocks upon Mount Lebanon are preserved with religious veneration by the Christians of that country. According to the missionaries in the East, the Patriarch of the Maronite Christians inhabiting Mount Lebanon, attended by a number of bishops, priests, and monks, and followed by five or six thousand devotees, annually celebrate in their shade the festival of the Transfiguration, which is called the *Feast of Cedars*; and ecclesiastical censures are denounced against those who shall injure these consecrated trees.

About the year 1680, the first stocks were brought to Europe and planted in the medical garden of Chelsea, near London; one hundred years after, two of them were upward of twelve and a half feet in circumference at two feet from the ground, and diffused their limbs more than twenty feet in every direction. They have yielded seed abundantly for more than half a century, and have given birth to the fine stocks that adorn the parks and gardens of the continent of Europe.

The beauty of the Cedar of Lebanon is due to the arrangement of its branches, which are verticillate with a slight inclination toward the earth, and to its thick, dark-green foliage, which casts a dense and impervious shade.

It flowers in the month of October: the cones are about three inches long and two broad, and do not arrive at complete ma-

turity before the second year. They are grayish, and very hard, in consequence of the compactness of the scales. To obtain the seeds, of which three-fourths are usually barren, the cone is pierced with a gimlet at the base, left to soak two days in water, and, after it is dry, opened by means of a small wooden wedge driven into the hole.

This tree is in great request for the fineness of its form: it is not difficult in the choice of soils, and develops itself luxuriantly on gravelly lands.

The young stock should be transplanted when the circulation begins to be renewed, which is indicated by the swelling of the buds; as much earth as possible should be left adhering to the roots, and they should be replaced in the ground without delay. When permanently fixed, its branches should never be lopped, and the main stem, which constantly inclines toward the north, should be carefully preserved.

PLATE CLIV.

A branch with a cone of the natural size.

[It would be no difficult task to fill several pages with eulogies on this tree, which from some cause was almost entirely neglected by our American ancestors, but one or two specimens of much size having come under my observation in the United States. Every person who plants should procure one specimen at least, even though he may not survive to see its perfect majesty and beauty. In England it is common, and appears nowhere without impressing the beholder with favorable ideas of the planter's taste. It is perfectly adapted to our climate, and young trees are to be readily procured in every extensive nursery. This, the *Deodara*, and the *Araucaria imbricata*, at the South, are essential to all grounds of even moderate extent.



Hort. del.

Bot. del. 1847

Red Cedar.
Juniperus virginiana

M. Laure, an officer of the French marine, who, with the Prince de Joinville, visited Mount Lebanon in 1836, says that all but one of the sixteen old Cedars mentioned by Belon in 1550, and by Maundrell in 1696, were still alive, although in a decaying state, and that one of the healthiest but perhaps the smallest trunks measured thirty-six English feet in circumference.]

RED CEDAR.

JUNIPERUS VIRGINIANA. *J. foliis ternis, basi adnatis, junioribus imbricatis, senioribus patulis.*

THE Red Cedar, which belongs to the Junipers, is the most common species of its genus in the United States, and the only one which attains such dimensions as to be useful in the arts. Next to that which grows in Bermuda, it is the largest hitherto discovered. According to my father's observations on the topography of American plants, Cedar Island, in Lake Champlain, nearly opposite to Burlington, in latitude $44^{\circ} 25'$, may be assumed as one of the remotest points at which it is found toward the north. Eastward, on the border of the sea, I have not seen it beyond Wiscasset, a small town of the district of Maine, at the mouth of the Kennebeck, and in nearly the same latitude with Burlington. From Wiscasset it spreads without interruption to the Cape of Florida, and thence round the Gulf of Mexico to a distance beyond St. Bernard's Bay,—an extent of more than three thousand miles. In retiring from the shore, it becomes gradually less common and less vigorous, and in Virginia and the more southern States it is rare at the point where the tide ceases to flow in the rivers; farther inland it is seen only

in the form of a shrub in open, dry, sandy places. In the Western States it is confined to spots where the calcareous rock shows itself naked, or is so thinly covered with mould as to forbid the vegetation of other trees.

Though the Red Cedar grows naturally in the district of Maine, and on some of the islands of Lake Champlain, it is repressed by a winter as intense as that of the North of Germany, and develops itself less vigorously than in Virginia, and farther south, where the soil and climate are favorable to its expansion and to the perfection of its wood. Upon the downs it is usually buried in the sand cast up by the waves, except the summit of the branches, which appear like young trees above the surface. When unencumbered with sand, as in the middle of the islands and on the borders of the narrow sounds that flow between them and the main, it is forty or forty-five feet in height and twelve or thirteen inches in diameter; but it would be difficult at present to find stocks of this size north-eastward of the river St. Mary within the ancient limits of the United States.

The foliage is evergreen, numerous subdivided, and composed of small sharp scales encased in one another. It diffuses a resinous, aromatic odor when bruised: dried and reduced to powder, it has the same effect as the common juniper, of increasing the efficacy of blister-plasters. The male and female flowers are small, not conspicuous, and borne separately on the same or on different stocks. The seeds are small, ovate berries, bluish when ripe, and covered with a white exudation. They arrive at maturity about the beginning of fall, and if sown immediately the greater part of them shoot the following spring, but not before the second year if they are kept several months. The quantity of gin made from them in the United States is small compared with what is imported from Holland.

The name of Red Cedar is descriptive only of the perfect wood, which is of a bright tint: the sap is perfectly white.

The most striking peculiarity in the vegetation of the Red Cedar is that its branches, which are numerous and close, spring near the earth and spread horizontally, and that the lower limbs are during many years as long as the body of the tree. The trunk decreases so rapidly that the largest stocks rarely afford timber for ship-building of more than eleven feet in length. Its diameter is very much diminished by deep, oblong crevices in every part of the trunk, which are occasioned by the large branches persisting after they are dead. My own observations and experiments lead me to believe that the growth of the tree might be thickened, and this deformity prevented, by cutting the limbs even with the trunk for two-thirds of its height.

The wood is odorless, compact, fine-grained, and very light, though heavier and stronger than that of the White Cedar and Cypress. To these qualities it unites the still more precious character of durability, and is consequently highly esteemed for such objects as require it in an eminent degree. But as it is procured with difficulty, and is every day becoming scarcer, it is reserved exclusively for the most important uses. The reproduction is too trifling to be mentioned in comparison with the consumption in the ports of the United States at large, and particularly at New York, Philadelphia, and Baltimore. In the upper part of the frame of vessels it is joined with the Live Oak to compensate its excessive weight; and this usage, more than any other, has wasted the species. Recourse is now had to the coast of East Florida between the St. Mary and the St. John, which will soon be exhausted in its turn. The nearer the Red Cedar grows to the sea, and the farther southward, the better is its wood. Next to ship-building, it is most commonly used for posts, which are highly esteemed and are reserved for enclosing court-yards and gardens in the cities and their vicinity. The barriers of the side-walks in the streets of Philadelphia are made of this wood; they are ten or eleven feet long

and eight inches in diameter, and are sold at eighty cents each, while those of White Cedar cost only sixteen or seventeen cents. It is eminently fitted for subterranean water-pipes, but is rarely employed, from the difficulty of obtaining stocks of sufficient diameter. Small, round, or oval tubs, very neatly wrought and hooped with brass, are made with staves consisting partly of the sap and partly of the heart. I have observed that the tanners at Philadelphia make the large stopcocks of this wood. In the Southern States it is commonly chosen for coffins.

In some parts of Lower Virginia, particularly in the county of York, the Cedars are trimmed and the branches interlaced with stakes driven into the earth at small distances, for the enclosure of cultivated fields; but this is a poor resource, the only advantage of which is the economy of wood.

The Red Cedar is exported to England, but I am unable to say for what purpose; probably it is not solely for the manufacture of pencils, though it seems as well adapted to that object as the Juniper of Bermuda.

The Red Cedar has been naturalized more than fifty years in the pleasure-grounds of France and England: its growth would be rapid on the borders of the sea in our southern departments, where its propagation cannot be too warmly recommended.

· PLATE CLV.

A branch with leaves and berries of the natural size.



H. J. Redouté del.

Labillard sculp.

Arbor vitae or White cedar.
Thuja occidentalis.

AMERICAN ARBOR-VITÆ,

OR

WHITE CEDAR.

THUYA OCCIDENTALIS. *T. ramulis ancipitibus, foliis quadrifarium imbricatis, ovato-rhombeis, adpressis, nudis, tuberculatis; strobilis ovatis; squamis oblonge-ovalibus; seminibus alatis.*

THIS species of *Thuya*—the only one that has been discovered in the New World—is the most interesting of the genus for the properties of its wood. My father mentions the shores of Lake St. John, in Canada, as its northern limit, beyond which he saw no trace of it in travelling in that direction more than three hundred miles. It abounds in favorable situations between the parallels of 48° 50' and 45°; farther south it becomes rare, and solitary stocks only are seen on the sides of torrents and on the banks of certain rivers, as on the Hudson amid the highlands, and near the *rapids* of the Potomac, in Virginia. Goat Island, round which the Niagara divides itself to form the stupendous cataract which is one of the most wonderful spectacles of nature, is seen from the banks of the river to be bordered with the Arbor-Vitæ.

In Canada and the northern part of the United States, this tree is called White Cedar; but in the district of Maine it is frequently designated by the name of Arbor-Vitæ, which I have preferred, though less common, because the other is appropriated to the *Cupressus thyoides*.

The Arbor-Vitæ is forty-five or fifty feet in height and sometimes more than ten feet in circumference; usually, however, it is not more than ten or fifteen inches in diameter at five feet from the ground. From the number and the distinctness of the

concentric circles in stocks of this size, its growth must be extremely slow: I have counted one hundred and seventeen in a log thirteen inches and five lines in diameter. They are more compressed near the centre, as in the Cypress and White Cedar, which is contrary to the arrangement observed in the Oaks, the Beeches, and the Maples.

The foliage is evergreen, numerously ramified, and flattened or spread. The leaves are small, opposite, imbricated scales; when bruised, they diffuse a strong aromatic odor. The sexes are separate upon the same tree. The male flowers are in the form of small cones; to the female blossom succeeds a yellowish fruit about four lines in length, composed of oblong scales, which open through their whole length for the escape of several minute seeds surmounted by a short wing.

In Lower Canada, New Brunswick, Vermont, and the district of Maine, the Arbor-Vitæ is the most multiplied of the resinous trees, after the Black and the Hemlock Spruces. A cool soil seems to be indispensable to its growth. It is never seen on the uplands among the Beeches, the Birches, &c., but is found on the rocky edges of the innumerable rivulets and small lakes which are scattered over these countries, and occupies in great part, or exclusively, swamps from fifty to one hundred acres in extent, some of which are accessible only in the winter, when they are frozen and covered with several feet of snow. It abounds exactly in proportion to the degree of humidity, and in the driest marshes it is mingled with the Black Spruce, the Hemlock Spruce, the Yellow Birch, the Black Ash, and a few stocks of the White Pine. In all of them, the surface is covered with a bed of sphagnum so thick and surcharged with moisture that the foot sinks half-leg deep while the water rises under its pressure.

The full-grown Arbor-Vitæ is easily distinguished by its shape and foliage. The trunk tapers rapidly from a very large base to a very slender summit, and is laden with branches

for four-fifths of its height. The principal limbs, widely distant and placed at right angles with the body, give birth to a great number of drooping secondary branches, whose foliage resembles that of the White Cedar.

On the borders of the lakes, where it has room and enjoys the benefit of the light and air, it rises perpendicularly, grows more rapidly and attains a greater size than when crowded in the swamps, where its thick foliage intercepts the light and impedes the circulation of the air. I have besides remarked that in the swamps its trunk is rarely straight, but forms the arch of an ellipse more or less inclined. Its sides swell into two or three large ridges, which are a continuation of the principal roots.

The bark upon the body is slightly furrowed, smooth to the touch, and very white when the tree stands exposed. The wood is reddish, somewhat odorous, very light, soft, and fine-grained: in the northern part of the United States, and in Canada, it holds the first place for durability. From the shape of the trunk, it is difficult to procure sticks of considerable length and a uniform diameter; hence, in the district of Maine it is little employed for the frame of houses, though in other respects proper for this object; and still less for the covering. It is softer than the White Pine, and gives a weaker hold to nails, for which reason the Canadians always join it with some more solid wood. The following extract from my father's journal confirms what I have said of its durability:—"In my journey to Hudson's Bay, in 1792, I arrived in August in the vicinity of Lake Chicoutomé, in latitude 48°. I found the mansion-house of the church established by the Jesuits for the instruction of the natives yet standing. This building, constructed in 1728, as was proved by an inscription over the door, with square beams of the Arbor-Vitæ laid upon one another without covering on either side, remained perfectly sound after more than sixty years."

The most common use of this tree is for rural fences, for which it is highly esteemed. The posts last thirty-five or forty years, and the rails sixty, or three or four times as long as those of any other species. The posts subsist twice as long in argillaceous as in sandy lands. While the use of such fences continues, the utmost economy should be practised in cutting the Arbor-Vitæ, according to the rules prescribed for resinous trees. In Canada it is selected for the light frame of bark canoes. Its branches, garnished with leaves, are formed into brooms, which exhale an agreeable aromatic odor. Kalm affirms that the leaves, pounded and moulded with hog's lard, form an excellent ointment for the rheumatism.

The Arbor-Vitæ was introduced into France more than two hundred years since; the superior beauty of its form and foliage entitle it to preference over the Chinese Thuya as an ornament of pleasure-grounds, and the quality of its wood is a sufficient motive for propagating it in unimproved marshes in the North of Europe; but the White Cedar, which is taller and of a more uniform diameter, more rapid in its growth, and of equal durability, would be a still more valuable acquisition.

PLATE CLVI.

A branch with leaves and cones of the natural size. Fig. 1. Seeds.

[*Soil, Propagation, &c.* This tree grows best in a cool, moist soil, but succeeds in any ground not too dry. As a hedge or screen, it has few compeers. At the residence of my friend, A. J. Downing, Esq., near Newburg, a screen of Arbor-Vitæ, in his grounds, was remarkable for its beauty and perfection.

As it ripens abundance of seeds, it is readily propagated; or it may be procured at a very small price from the State of Maine.]

[See Nuttall's Supplement, vol. ii. p. 163.]

